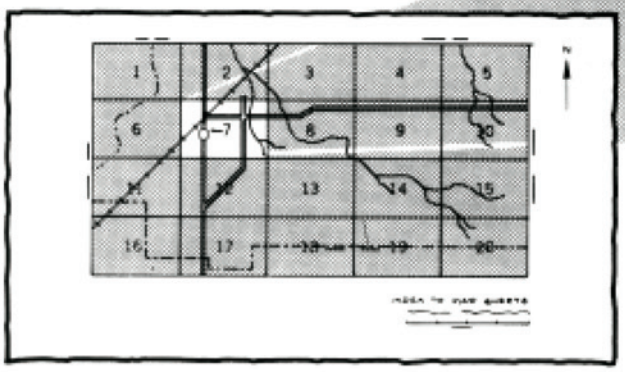
SOIL SURVEY OF

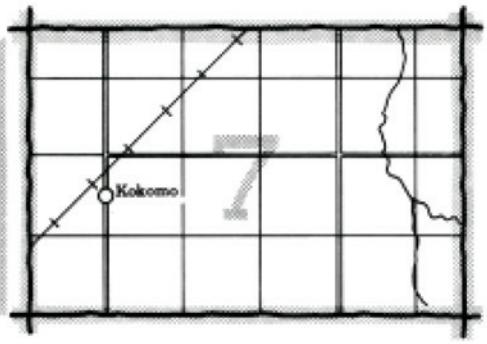
Bosque County, Texas

United States Department of Agriculture, Soil Conservation Service
in cooperation with Texas Agricultural Experiment Station

HOW TO USE

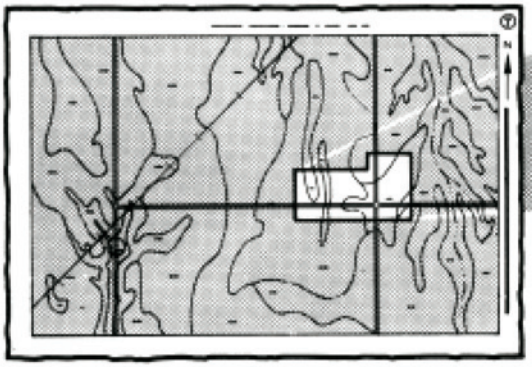
1. Locate your area of interest on the "Index to Map Sheets"

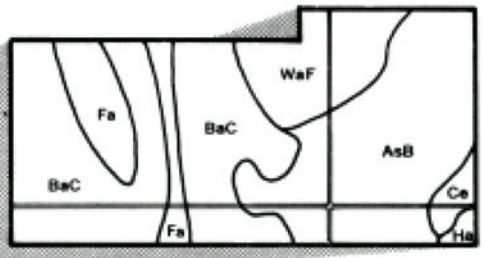




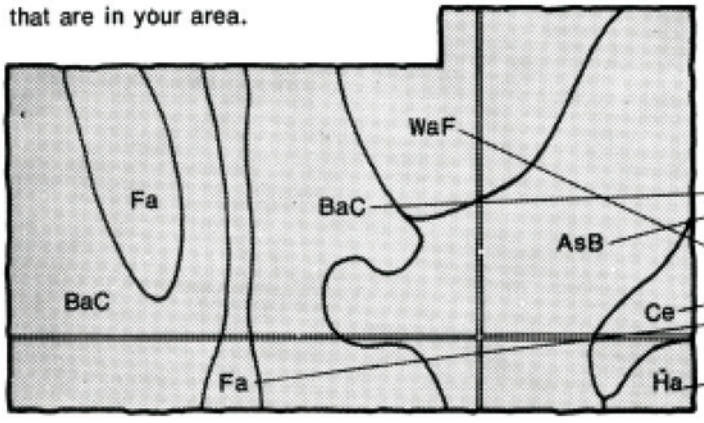
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.

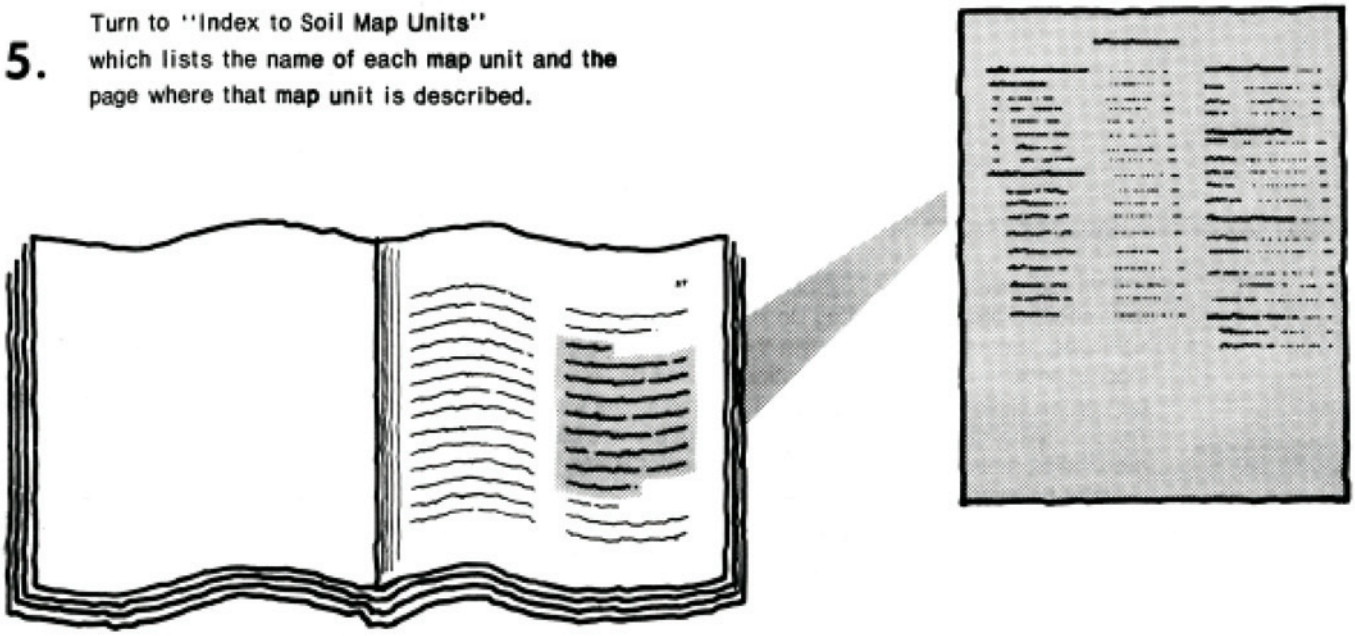


Symbols

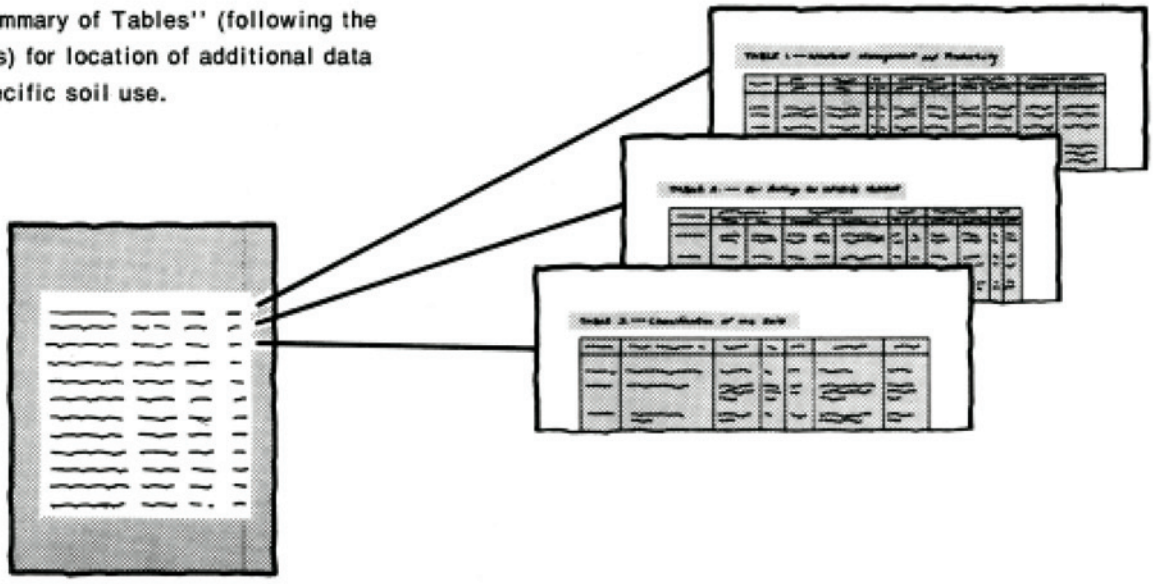
AsB
BaC
Ce
Fa
Ha
WaF

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1971-77. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Bosque Soil and Water Conservation District.

Cover: Cranfill gravelly clay loam, 3 to 5 percent slopes, foreground, and Brackett-Eckrant association, hilly, background, are used mainly for rangeland and wildlife habitat.

Contents

	Page
Index to map units	iv
Summary of tables	v
Foreword	vii
General nature of the county	1
History	1
Agriculture	1
Natural resources	1
Climate	2
How this survey was made	2
General soil map for broad land use planning	2
Dominantly very shallow to deep, well drained soils underlain by limestone	3
1. Eckrant-Brackett-Cranfill	3
2. Denton-Purves	3
3. Tarrant-Denton	4
4. Purves-Maloterre	4
5. Mosheim-Searsville	4
Deep, well drained soils on flood plains and stream terraces	4
6. Krum-Sunev	5
7. Bastrop-Minwells-Yahola	5
8. Frio-Bosque	5
Deep, moderately well drained and well drained soils on uplands	6
9. Windthorst-Duffau	6
Soil maps for detailed planning	6
Use and management of the soils	29
Crops and pasture	29
Yields per acre	30
Land capability classification	31
Rangeland	31
Recreation	32
Wildlife habitat	33
Engineering	35
Building site development	35
Sanitary facilities	36
Construction materials	37
Water management	38
Soil properties	38
Engineering index properties	39
Physical and chemical properties	39
Soil and water features	40
Engineering index test data	41
Classification of the soils	42
Soil series and morphology	42
Bastrop series	42
Bolar series	43
Bosque series	43
Brackett series	44
Cranfill series	44
Crawford series	45
Denton series	45
Duffau series	46
Eckrant series	46
Frio series	47
Gaddy series	47
Hassee series	47
Krum series	48
Maloterre series	48
Minwells series	49
Mosheim series	49
Paluxy series	50
Purves series	50
San Saba series	50
Searsville series	51
Seawillow Variant	51
Selden series	52
Slidell series	52
Sunev series	53
Tarpley series	53
Tarrant series	54
Windthorst series	54
Yahola series	55
Formation of the soils	55
Parent material	55
Climate	55
Plant and animal life	56
Relief	56
Time	56
References	56
Glossary	57
Tables	63

Issued May 1980

Index to map units

	Page
1—Bastrop loamy fine sand, 1 to 5 percent slopes	7
2—Bastrop fine sandy loam, 0 to 1 percent slopes	7
3—Bastrop fine sandy loam, 1 to 3 percent slopes	7
4—Bastrop fine sandy loam, 3 to 5 percent slopes	8
5—Bastrop fine sandy loam, 1 to 5 percent slopes, eroded	8
6—Bolar clay loam, 1 to 3 percent slopes	8
7—Bolar clay loam, 3 to 5 percent slopes	9
8—Bosque loam, occasionally flooded	9
9—Brackett gravelly clay loam, 1 to 5 percent slopes	9
10—Brackett-Eckrant association, hilly	9
11—Cranfill gravelly clay loam, 3 to 5 percent slopes	10
12—Cranfill gravelly clay loam, 3 to 5 percent slopes, eroded	10
13—Cranfill gravelly clay loam, 5 to 8 percent slopes	11
14—Cranfill gravelly clay loam, 5 to 8 percent slopes, eroded	12
15—Cranfill gravelly clay loam, 3 to 8 percent slopes, severely eroded	12
16—Crawford clay, 1 to 3 percent slopes	13
17—Denton silty clay, 1 to 3 percent slopes	13
18—Denton silty clay, 3 to 5 percent slopes	13
19—Duffau fine sandy loam, 1 to 3 percent slopes	14
20—Duffau fine sandy loam, 3 to 5 percent slopes	15
21—Duffau fine sandy loam, 1 to 5 percent slopes, eroded	15
22—Eckrant association, gently undulating	15
23—Frio silty clay loam, occasionally flooded	16
24—Hassee fine sandy loam, 0 to 2 percent slopes	16
25—Krum clay, 0 to 1 percent slopes	17
26—Krum clay, 1 to 3 percent slopes	17
27—Maloterre-Tarrant complex, 1 to 8 percent slopes	18
28—Minwells fine sandy loam, 1 to 3 percent slopes	18
29—Minwells fine sandy loam, 3 to 5 percent slopes	19
30—Minwells fine sandy loam, 1 to 5 percent slopes, eroded	19
31—Mosheim silty clay, 1 to 3 percent slopes	20
32—Paluxy very fine sandy loam, 0 to 1 percent slopes	20
33—Paluxy very fine sandy loam, 1 to 3 percent slopes	21
34—Paluxy very fine sandy loam, 5 to 8 percent slopes	21
35—Pits	21
36—Purves clay, 1 to 3 percent slopes	21
37—Purves clay, 3 to 5 percent slopes	22
38—Purves gravelly clay, 1 to 5 percent slopes	22
39—Purves-Maloterre association, undulating	22
40—San Saba clay, 1 to 3 percent slopes	23
41—Searsville clay, 1 to 3 percent slopes	23
42—Searsville gravelly clay, 1 to 5 percent slopes	24
43—Seawillow Variant clay loam, 1 to 5 percent slopes	24
44—Selden loamy fine sand, 1 to 5 percent slopes	24
45—Slidell clay, 0 to 1 percent slopes	25
46—Slidell clay, 1 to 3 percent slopes	25
47—Sunev clay loam, 0 to 1 percent slopes	25
48—Sunev clay loam, 1 to 3 percent slopes	26
49—Tarpley clay loam, 1 to 3 percent slopes	26
50—Tarrant association, undulating	26
51—Windthorst fine sandy loam, 1 to 3 percent slopes	26
52—Windthorst fine sandy loam, 3 to 5 percent slopes	27
53—Windthorst fine sandy loam, 1 to 5 percent slopes, eroded	28
54—Windthorst fine sandy loam, 1 to 8 percent slopes, severely eroded	28
55—Yahola-Gaddy complex, frequently flooded	29

Summary of tables

	Page
Table 1—Temperature and precipitation	64
Table 2—Freeze dates in spring and fall *Probability. Temperature.*	65
Table 3—Growing season *Probability. Daily minimum temperature.*	65
Table 4—Potential of map units on the general soil map *Percent of area. Cultivated crops. Pasture. Rangeland. Urban uses.*	66
Table 5—Acreage and proportionate extent of the soils *Acres. Percent.*	67
Table 6—Yields per acre of crops and pasture *Grain sorghum. Wheat. Oats. Improved bermudagrass. Cotton lint.*	68
Table 7—Capability classes and subclasses *Total acreage. Major management concerns.*	70
Table 8—Rangeland productivity and characteristic plant communities *Range site. Total production. Characteristic vegetation. Composition.*	71
Table 9—Recreational development *Camp areas. Picnic areas. Playgrounds. Paths and trails.*	76
Table 10—Wildlife habitat *Potential for habitat elements. Potential as habitat for—Openland wildlife, Wetland wildlife, Rangeland wildlife.*	79
Table 11—Building site development *Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets.*	82
Table 12—Sanitary facilities *Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.*	85
Table 13—Construction materials *Roadfill. Sand. Gravel. Topsoil.*	88
Table 14—Water management *Limitations for—Pond reservoir areas; Embankments, dikes, and levees. Features affecting—Drainage, Irrigation, Terraces and diversions, Grassed waterways.*	90

Summary of tables—Continued

Page

Table 15—Engineering index properties 92
Depth. USDA texture. Classification—Unified, AASHTO. Fragments greater than 3 inches. Percentage passing sieve—4, 10, 40, 200. Liquid limit. Plasticity index.

Table 16—Physical and chemical properties of soils 96
Depth. Clay. Permeability. Available water capacity. Soil reaction. Shrink-swell potential. Erosion factors. Wind erodibility group. Organic matter.

Table 17—Soil and water features 98
Hydrologic group. Flooding. High water table. Bedrock. Risk of corrosion.

Table 18—Engineering test data 100
Classification. Grain size distribution. Liquid limit. Plasticity index. Specific gravity. Shrinkage.

Table 19—Classification of the soils 102
Family or higher taxonomic class.

Foreword

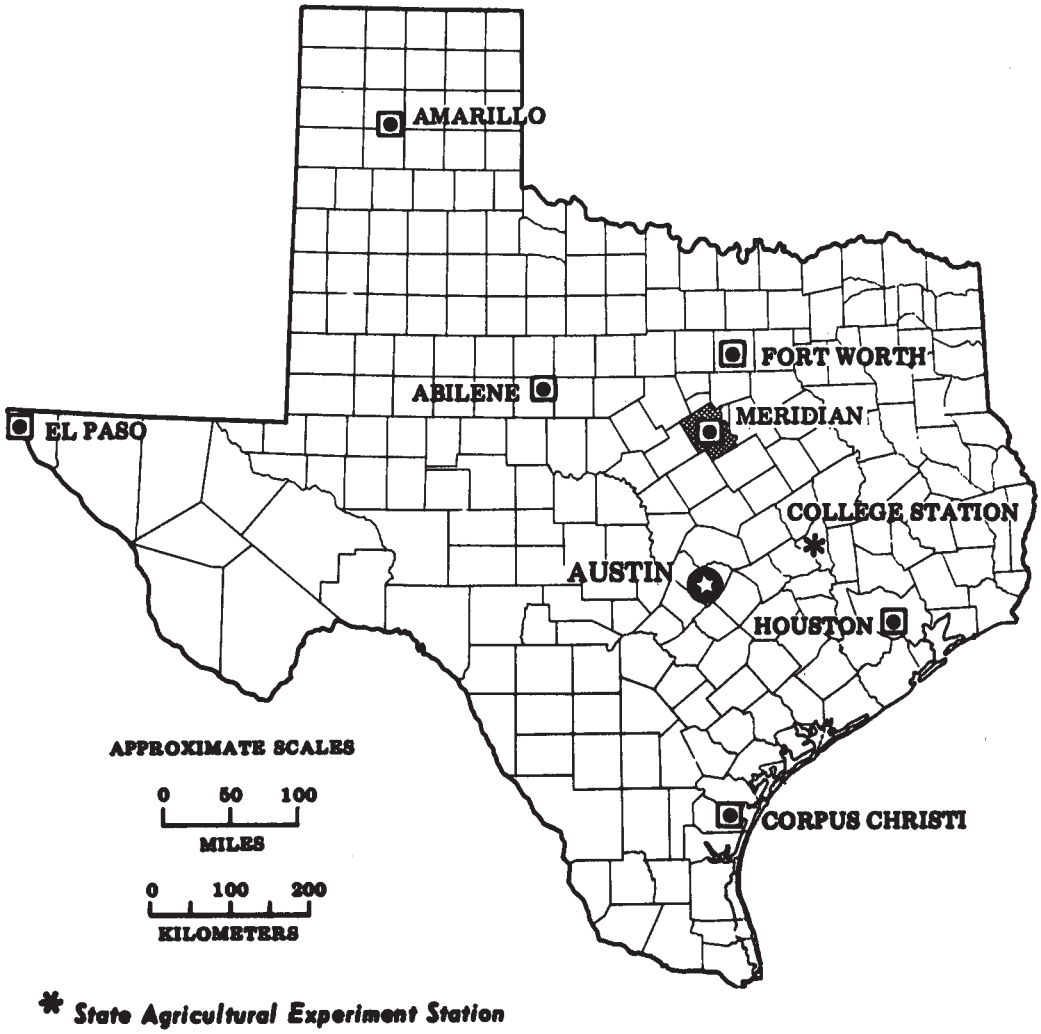
This soil survey contains information that can be used in land-planning programs in Bosque County, Texas. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

George C. Marks
State Conservationist
Soil Conservation Service



Location of Bosque County in Texas.

SOIL SURVEY OF BOSQUE COUNTY, TEXAS

By Billy R. Stringer, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with Texas Agricultural Experiment Station

BOSQUE COUNTY is in the east-central part of Texas. The total area of the county is 641,920 acres, which includes 8,512 acres of water. Meridian, the county seat, is located near the center of the county.

Small urban areas included Clifton, Valley Mills, Iredell, Walnut Springs, Kopperl, Morgan, Cranfills Gap, Laguna Park, Lakeside Village, and Mosheim. State highways and farm roads link all parts of the county, and a railroad crosses it from north to south.

The principal uses of land are livestock grazing of tame pasture and rangeland and cropland. In general, the relief is broad prairies that have scattered cedar, oak, and mesquite trees and rangeland on low hills and on some higher hills and peaks. The county drainage includes the Brazos and Bosque Rivers. Elevation ranges from 500 to 1,200 feet.

General nature of the county

This section gives general information concerning the county's history, agriculture, natural resources, and climate.

History

Bosque County was created in 1854 by action of the Texas State Legislature. The word "Bosque" is a Spanish word meaning "woods" or "woody", which is descriptive of the area especially the many trees that line the Bosque River Valley.

The town of Meridian was named after Meridian Creek and the Meridian Mountains. The county courthouse was built of native stone in 1886, and it is still in use.

Early settlers were families who farmed in the valleys and prairies of the Bosque River, Meridian Creek, and Neil Creek. This is the same general area in which the Tonkawa Indians farmed and lived.

The county has consisted primarily of ranches and farms; urban development has not been significant. The 1860 census of the county indicated a population of 2,005; the 1920 census was 18,032; and the 1970 census was 11,600.

Agriculture

In agriculturally oriented Bosque County, rangeland dominates. Small areas of cropland, mainly for small grains, are scattered throughout. The county is one of the leading producers of oats in Texas. Beef cattle is the main livestock enterprise, but some farms have dairy cattle herds. Poultry is also important in the county. The acreage of tame pasture is increasing as marginal cropland or brush areas are established with improved grasses.

A succession of dry years in the 1950's forced many farmers to leave their farms. Many acres of cropland were seeded to grass or remained idle. The average size of the farms and ranches has increased as landowners purchased additional land to make their more mechanized operation economically sound.

The capabilities of the soils in Bosque County, climate, and economic conditions indicate that the future of Bosque will most likely continue to be based on a mixture of rangeland, tame pasture, and cropland.

Natural resources

Soil is the most important natural resource in the county. Livestock that grazes the grassland and grain harvested on the farms are the marketable products derived from the soil. Much sand, gravel, and limestone are mined in the county for construction. Also, wildlife is an important natural resource; much land is leased each year for hunting and fishing.

In 1951, a concrete and rolled earth-filled dam was constructed on the Brazos River to form Lake Whitney. The reservoir is used for flood control, recreation, and power generation. In most of the county, the supply of water is adequate for domestic use, livestock, and irriga-

tion. Numerous lakes, ponds, and rivers provide water for livestock and recreation.

Climate

Prepared by the National Climatic Center, Asheville, N.C.

Bosque county is hot in summer but cool in winter when an occasional surge of cold air causes a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, reaching a slight peak in spring. Snowfalls are infrequent. Annual total precipitation is normally adequate for cotton, feed grains, and small grains.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Whitney Dam, Tex., from 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 47 degrees F, and the average daily minimum temperature is 35 degrees. The lowest temperature on record, which occurred at Whitney Dam on February 2, 1951, is -3 degrees. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 95 degrees. The highest recorded temperature, which occurred on July 26, 1954, is 111 degrees.

Growing degree days, shown in table 3, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 19 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 14 inches. The heaviest 1-day rainfall during the period of record was 6.22 inches at Whitney Dam on October 19, 1971. Thunderstorms occur on about 50 days each year, and most occur in spring.

Snowfall is rare; in 80 percent of the winters there is no measureable snowfall. In 10 percent, the snowfall, usually of short duration, is more than 2 inches. The heaviest 1-day snowfall on record was more than 3 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 75 in summer and 50 in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in spring.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, pasture, rangeland,* and *urban uses*. Cultivated crops are those grown extensively in the survey area. Pasture refers to land in introduced grasses managed intensively for forage production. Rangeland refers to land in native or introduced range plants. Urban uses include residential, commercial, and industrial developments.

Descriptions and potentials of map units shown in the general soil map are described on the following pages. The terms for texture used in each soil map unit apply to the surface layer, such as clayey and loamy.

Dominantly very shallow to deep, well drained soils underlain by limestone

The soils in this group make up about 80 percent of the county. The major soils are Eckrant, Brackett, Cranfill, Denton, Purves, Tarrant, Maloterre, Mosheim, and Searsville. These gently sloping to steep soils have a clayey and loamy surface layer that is gravelly or cobbly.

Most of these soils are used as rangeland. Vegetation is dominantly mid and tall grasses as well as scattered Ashe juniper and mottes of live oak trees. Cropland is used for cotton, grain sorghum, or small grains.

1. Eckrant-Brackett-Cranfill

Very shallow, shallow, and deep, gently sloping to steep clayey and loamy soils that are cobbly or gravelly

These gently sloping to steep soils are on plateaus and flat topped mesas and along drainageways. Slopes range from 1 to 40 percent. The Eckrant soils are mainly on the upper slopes, the Brackett soils are on the middle slopes, and the Cranfill soils are on the lower slopes.

This map unit occupies about 39 percent of the county. The Eckrant soils make up about 38 percent of this unit, the Brackett soils about 13 percent, the Cranfill soils about 25 percent, and other soils about 24 percent.

The Eckrant soils typically have a very dark gray cobbly clay surface layer about 10 inches thick. About half of this layer is cobbly and has fragments of limestone. The underlying layer is fractured indurated limestone bedrock.

The Brackett soils typically have a light brownish gray gravelly clay loam surface layer about 8 inches thick. The next layer is light yellowish brown clay loam about 7 inches thick. The underlying material to 60 inches is interbedded clay loam and limestone fragments.

The Cranfill soils typically are brownish, calcareous gravelly clay loam to 80 inches or more. The lower part has many limestone fragments and calcium carbonate concretions.

The other soils in this map unit are the Bolar, Crawford, Denton, Maloterre, Purves, Seawillow, Sunev, Tarpley, and Tarrant soils. Bolar soils are on low knolls. Nearly level and gently sloping Crawford, Denton, Purves, and Tarpley soils are near the centers of large plateaus. Seawillow and Sunev soils are on foot slopes along drainageways. Maloterre soils are on some of the lower slopes. Tarrant soils are dominantly on broken and steep areas.

This unit is used mainly for rangeland. Live oak, Texas oak, and Ashe juniper trees are scattered over these soils.

This unit has low potential for rangeland. The main limitations are soil depth and slope. Controlled grazing and brush management help increase production. The potential for cropland, pasture, and most urban uses is low because of shallow or very shallow depth to limestone bedrock in most of the soils, small stones, and slope. The potential is high for wildlife habitat. An abundance of forbs and browse plants, along with a vegetative cover, provides a good habitat for deer.

2. Denton-Purves

Moderately deep and shallow, gently sloping and sloping clayey soils

This map unit is on uplands that have slopes of 1 to 8 percent.

This unit occupies about 22 percent of the county. The Denton soils make up about 30 percent of this unit, Purves soils about 29 percent, and other soils 41 percent.

The Denton soils typically have a dark grayish brown silty clay surface layer about 5 inches thick. The next layer from 5 to 40 inches is brown silty clay that has many limestone fragments in the lower 4 inches. Below 40 inches is limestone bedrock.

The Purves soils typically have a dark grayish brown clay surface layer about 7 inches thick. The next layer is brown clay with common concretions of calcium carbonate in the upper part and many in the lower part. Below 18 inches is indurated limestone.

The other soils in this unit are Bolar, Brackett, Crawford, Krum, Maloterre, Slidell, Sunev, Tarpley, and Tarrant. Bolar, Brackett, Maloterre, and Tarrant soils are on low knolls. Crawford and Tarpley soils occur in slightly lower areas. Krum, Slidell, and Sunev soils are on slopes adjacent to streams.

This unit is used mainly for cropland. It has a medium potential. The deeper soils are terraced to help control

erosion, but the shallow soils are difficult to terrace. Close-spaced or drilled crops help control erosion.

The potential for rangeland is high. The potential for pasture is medium. The potential for most urban uses is medium. Depth to rock is the main limitation.

3. Tarrant-Denton

Very shallow to moderately deep, gently sloping and undulating clayey soils that are cobbly

This map unit occupies broad uplands that are dissected by drainageways and streams. Slopes range from 1 to 8 percent.

This unit occupies about 8 percent of the county. The Tarrant soils make up about 55 percent of this unit, Denton soils about 11 percent, and other soils 34 percent.

The Tarrant soils typically have a surface layer of very dark grayish brown, calcareous cobbly clay about 12 inches thick that has many limestone fragments. Below 12 inches is fractured, indurated, platy limestone bedrock.

The Denton soils typically have a surface layer of dark grayish brown, calcareous silty clay about 6 inches thick. The next layer from 6 to 30 inches is brown, calcareous silty clay that has many limestone fragments in the lower 4 inches. Below is indurated limestone.

The other soils in this unit are Bolar, Brackett, Crawford, Krum, Maloterre, Purves, Sunev, and Tarpley. Bolar, Brackett, and Maloterre soils are on low knolls and narrow sharp breaks on slopes. Crawford, Purves, and Tarpley soils on plane slopes occur near the centers of the large mapped areas. Krum and Sunev soils are on slopes adjacent to streams.

This unit is used mainly for rangeland. It has a medium potential for this use. Controlled grazing and brush management help increase pasture production. The potential is low for crops, pasture, and urban uses because of depth to rock and small stones or gravel.

4. Purves-Maloterre

Shallow and very shallow, gently sloping and undulating clayey and loamy soils that are gravelly

This map unit is on broad limestone ridges and slopes that have a benched or stairstep appearance. Slopes range from 1 to 8 percent.

This unit occupies about 8 percent of the county. The Purves soils make up about 45 percent, Maloterre soils about 40 percent, and other soils 15 percent.

The Purves soils typically have a dark grayish brown clay surface layer about 7 inches thick. The next layer is brown clay that has common concretions of calcium carbonate in the upper part and many in the lower part. Below 18 inches is indurated limestone.

The Maloterre soils typically have a dark grayish brown gravelly clay loam surface layer about 5 inches thick that has many limestone shells and fragments. Below 5 inches is indurated limestone containing interbedded shell fossils.

The other soils in this unit are Bolar, Brackett, Denton, Eckrant, Frio, Krum, Sunev, and Tarrant soils. Bolar, Brackett, Eckrant, and Tarrant soils are on low knolls. Denton and Krum soils are on lower slopes. Frio and Sunev are along drainageways.

This unit has medium potential for rangeland and this is the main use. Soil depth is the main limitation for rangeland forage production. Management includes proper stocking, controlled grazing with adequate rest periods, and brush management. The potential for crops, pasture, and urban uses is low because of small stones or gravel and depth of soil to rock.

5. Mosheim-Searsville

Deep and shallow, gently sloping clayey soils

This map unit occupies concave valleys and uplands. Slopes range from 1 to 5 percent.

This unit makes up about 3 percent of the county. The Mosheim soils make up about 21 percent of this unit, the Searsville soils about 20 percent, and other soils about 59 percent.

The Mosheim soils typically have a surface layer of brown calcareous silty clay about 8 inches thick. The next layer to a depth of 48 inches is calcareous silty clay that is dark brown in the upper part, reddish brown in the middle part, and brown in the lower part. Below 48 inches is fractured limestone.

The Searsville soils typically have a surface layer of reddish brown calcareous clay about 7 inches thick. The next layer to a depth of 18 inches is calcareous clay that is red in the upper part and yellowish red in the lower part. Below 18 inches is indurated limestone.

The other soils in this unit are the Bolar, Brackett, Denton, Eckrant, Frio, Krum, Purves, San Saba, Slidell, and Sunev soils. Bolar, Brackett, and Eckrant soils are on low knolls. Denton and Purves soils are on uplands that have plane slopes. Frio, Krum, and Sunev soils are along drainageways. San Saba and Slidell soils are on plane slopes that have a gilgai (microvalleys and microridges) microrelief.

This unit has high potential for crops, and this is the main use. The deeper soils are terraced to help control erosion, but the shallow soils are difficult to terrace and require close-spaced or drilled crops to control erosion. Tillage should be timely and limited on soils in this unit.

The potential for rangeland is high. The potential for pasture is medium. The potential for most urban uses is medium because of depth to rock and small stones or gravel.

Deep, well drained soils on flood plains and stream terraces

This group of map units makes up about 18 percent of the county. The major soils are Krum, Sunev, Bastrop,

Minwells, Yahola, Frio, and Bosque. These nearly level to gently sloping soils have a clayey to sandy surface layer.

Most of the soils in this unit are used for crops or pasture. The main crops are cotton, grain sorghum, peanuts, and small grains. Improved grasses for pastures are mostly Coastal bermudagrass or kleingrass.

6. Krum-Sunev

Nearly level and gently sloping, clayey and loamy soils

The soils of this map unit occupy long narrow bands in concave valleys. Slopes range from 0 to 3 percent.

This unit makes up about 12 percent of the county. The Krum soils make up about 34 percent of this unit, Sunev soils about 23 percent, and other soils the remaining 43 percent.

The Krum soils typically have a surface layer of dark grayish brown, calcareous clay about 5 inches thick. Extending to about 63 inches is calcareous silty clay that is very dark grayish brown in the upper part, brown in the middle part, and brownish yellow in the lower part.

The Sunev soils typically have a surface layer of dark grayish brown, calcareous clay loam about 18 inches thick. Extending to about 60 inches is calcareous clay loam that is brown in the upper part and pale brown in the lower part.

The other soils in this unit are Bosque, Cranfill, Denton, Frio, Purves, San Saba, Seawillow, and Slidell. Bosque and Frio soils are on flood plains. Cranfill soils are on higher slopes. Denton and Purves soils are on knolls and ridges. San Saba and Slidell soils are on plane slopes that have a gilgai (microvalleys and microridges) microrelief. The sloping Seawillow soils are adjacent to drainageways.

This unit has high potential for crops, and this is the main use. For cultivated crops erosion control with terraces or crop residue helps control erosion. The potential is high for pasture and rangeland. The potential for most urban uses is medium because of the shrink-swell properties of the soils.

7. Bastrop-Minwells-Yahola

Nearly level and gently sloping, loamy and sandy soils

This map unit occupies nearly level to gently sloping areas along streams. Slopes range from 0 to 5 percent.

This unit occupies about 3 percent of the county. The Bastrop soils make up about 40 percent of this unit, Minwells soils about 30 percent, Yahola soils about 4 percent, and other soils make up the remaining 26 percent.

The Bastrop soils typically have a surface layer of brown, slightly acid fine sandy loam about 25 inches thick. The underlying layer from 15 to 80 inches is sandy clay loam that is reddish brown in the upper part and grades to reddish yellow in the lower part. These soils typically are slightly acid in the upper part and moderately alkaline in the lower part.

The Minwells soils typically have a surface layer of brown fine sandy loam about 14 inches thick. From 14 to 36 inches is red sandy clay. The underlying layer from 36 to 80 inches is sandy clay loam that is reddish brown in the upper part and yellowish red in the lower part. These soils are typically slightly acid in the upper part and moderately alkaline in the lower part.

The Yahola soils typically have a surface layer of brown, calcareous fine sandy loam about 10 inches thick. The underlying material, extending to 63 inches, is calcareous fine sandy loam that is reddish brown in the upper part and yellowish red in the lower part.

The other soils in this unit are Brackett, Cranfill, Gaddy, Hassee, Paluxy, and Sunev. Brackett and Cranfill soils are on higher slopes, and the Gaddy soils are on lower areas adjacent to streams and drainageways. Hassee and Paluxy soils are in depressional, or plane areas. Sunev soils are on slightly higher nearly level and gently sloping areas.

This unit has high potential for cultivated crops, and this is the main use. Terraces or crop residues help control erosion on the gently sloping soils. The potential is high for pasture, range, and most urban uses, except on the Yahola soils that are subject to flooding.

8. Frio-Bosque

Nearly level, loamy soils

This map unit occupies the nearly level areas along streams and rivers. Slopes range from 0 to 1 percent.

This unit occupies about 3 percent of the county. The Frio soils make up about 70 percent of this unit, Bosque soils about 20 percent, and other soils the remaining 10 percent.

The Frio soils typically have a surface layer of dark grayish brown, calcareous silty clay loam about 5 inches thick. The underlying layer to about 63 inches is very dark grayish brown, calcareous silty clay that grades to grayish brown in the lower part.

The Bosque soils typically have a surface layer of calcareous loam, about 26 inches thick, that is brown in the upper part and dark grayish brown in the lower part. Extending to 63 inches is calcareous loam that is pale brown in the upper part and light yellowish brown in the lower part.

The other soils in this unit are the Brackett, Krum, Seawillow, Slidell, and Sunev soils. Brackett soils are on higher knolls. Krum and Sunev soils are on higher areas adjacent to uplands. Seawillow soils are on breaks above flood plains. Slidell soils are on plane slopes that have gilgai microrelief.

This unit has high potential for cultivated crops, and this is the main use. Wetness and flooding are the main limitations. The potential is high for pasture and range. The potential for most urban uses is low because of the flood hazard. Some areas of this unit provide a habitat for deer, turkey, and squirrel.

Deep, moderately well drained and well drained soils on uplands

These soils make up about 2 percent of the county. The major soils are the Windthorst and Daffu. These gently sloping and sloping soils have a loamy surface layer. Most of these soils are used for crops. Grain sorghum, small grains, and peanuts are the main crops. Some areas are in pastures of Coastal bermudagrass or kleingrass.

9. Windthorst-Duffau

Gently sloping and sloping loamy soils

This map unit occupies gently sloping to sloping uplands dissected by many drainageways. Slopes range from 1 to 5 percent.

This unit makes up about 2 percent of the county. The Windthorst soils make up about 60 percent of this unit, Duffau soils about 15 percent, and other soils 25 percent.

Typically, the Windthorst soils have a surface layer of yellowish brown, slightly acid fine sandy loam about 3 inches thick. The next layer to 42 inches is a reddish, slightly acid sandy clay. The next layer to 54 inches is very pale brown, neutral sandy clay loam. The underlying layer is white shaly clay.

The Duffau soils typically have a surface layer of brown fine sandy loam about 11 inches thick. The next layer to about 60 inches is slightly acid sandy clay loam that is yellowish red in the upper part and reddish yellow in the lower part. The next layer to 68 inches is reddish yellow neutral fine sandy loam.

The other soils in this unit are Bosque, Hassee, Krum, Maloterre, Purves, Selden, and Sunev. Bosque soils are along streams and drainageways. Hassee soils are on plane to concave areas. Krum and Sunev soils are adjacent to streams and drainageways. Maloterre and Purves soils are on higher slopes and knolls. Selden soils are on ridges and knolls on slightly higher areas.

This unit has medium potential for crops and this is the main use. Soil texture, erosion hazard, and slope are the main limitations. The potential is high for range or pasture. The potential for most urban uses is medium because of shrink-swell properties.

Soil maps for detailed planning

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Purves clay, 1 to 3 percent slopes, is one of several phases in the Purves series.

Some map units are made up of two or more major soils. These map units are called soil complexes or soil associations.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Maloterre-Tarrant complex, 1 to 8 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Brackett-Eckrant association, hilly, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil descriptions of map units on the detailed maps are described on the following pages.

1—Bastrop loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on stream terraces. Areas are irregular in shape and range from 10 to 50 acres.

Typically, the surface layer is brown, slightly acid loamy fine sand about 17 inches thick. From 17 to 35 inches is reddish brown, slightly acid sandy clay loam. From 35 to 65 inches is yellowish red, neutral sandy clay loam. From 65 to 80 inches is reddish yellow, moderately alkaline sandy clay loam that has a few concretions and soft masses of calcium carbonate.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The soil blowing hazard is severe, and the water erosion hazard is moderate.

Included in mapped areas of this soil are small areas of Hassee, Minwells, and Paluxy soils. They make up less than 20 percent of this map unit.

Potential of this Bastrop soil for cultivated crops is high, and this is the main use. Peanuts, grain sorghum, and truck crops are the major crops. Also, fruit and nut trees grow well on this soil. Cover cropping, wind stripcropping, and return of crop residue to the soil surface help control soil blowing and improve soil productivity. Crops on this soil respond well to fertilizer. The potential for pasture plants is high. Bermudagrass and lovegrass are the commonly used grasses on this soil.

This soil has high potential for native range plants. The climax plant community is a savannah of tall and mid grasses with scattered trees and mottes. Management includes proper stocking, controlled grazing, and brush control. The potential for most urban uses is high.

This Bastrop soil is in capability subclass IIIe and in Loamy Sand range site.

2—Bastrop fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on stream terraces. Areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is brown fine sandy loam about 15 inches thick. From 15 to 80 inches is sandy clay loam. This layer is reddish brown in the upper part, yellowish red in the middle part, and light yellowish brown in the lower part with common concretions of calcium carbonate. This soil is slightly acid in the upper part and moderately alkaline in the lower part.

This soil is well drained. Permeability is moderate, and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is slight. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Hassee, Minwells, Paluxy, Yahola, and nearly level Bastrop soils. They make up less than 15 percent of this map unit.

Potential of this Bastrop soil for cultivated crops is high, and this is the main use. Peanuts, grain sorghum, and truck crops are the major crops. Also, fruit and nut trees grow well on this soil. Cover crops and return of plant residues help control erosion and maintain productivity. Crops on this soil respond well to fertilizer. The potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly used grasses on this soil.

This soil has high potential for native range plants. The climax plant community is a savannah of tall and mid grasses with scattered post oak trees and mottes. Management includes proper stocking, controlled grazing, and brush control.

The potential for most urban uses is high.

This Bastrop soil is in capability class I and in Sandy Loam range site.

3—Bastrop fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on stream terraces. Areas are irregular in shape and range from 20 to 200 acres. Slopes are plane to slightly convex and average 2 percent.

Typically, the surface layer is brown fine sandy loam about 15 inches thick. From 15 to 80 inches is sandy clay loam that is reddish brown in the upper part, yellowish red in the middle, and reddish yellow in the lower part. This soil is slightly acid in the upper part and moderately alkaline in the lower part.

This soil is well drained. Permeability is moderate, and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion and the soil blowing hazards are moderate.

Included in mapped areas of this soil are small areas of Hassee, Minwells, Paluxy, and Yahola soils. They make up less than 20 percent of this map unit.

Potential of this Bastrop soil for cultivated crops is high and this is the main use. Peanuts, grain sorghum, and truck crops are the major crops. Also, fruit and nut trees grow well on this soil. Terraces, contour cultivation, and return of crop residues to the soil surface help control erosion, conserve moisture, and maintain productivity. Crops on this soil respond well to fertilizer. The potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly used grasses on this soil.

This soil has high potential for native range plants. The climax plant community is a savannah of tall and mid grasses with scattered post oak trees and mottes. Management includes proper stocking, controlled grazing, and brush control.

The potential for most urban uses is high.

This Bastrop soil is in capability subclass IIe and in Sandy Loam range site.

4—Bastrop fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on stream terraces. Areas are irregular in shape and range from 10 to 50 acres. Slopes are plane to convex and average 4 percent.

Typically, the surface layer is brown slightly acid fine sandy loam about 13 inches thick. From 13 inches extending to about 80 inches is sandy clay loam that is reddish brown in the upper part and yellowish red in the lower part. This soil is slightly acid in the upper layers and moderately alkaline in the lower part.

This soil is well drained. Permeability is moderate, and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion and the soil blowing hazards are moderate.

Included in mapped areas of this soil are small areas of Minwells and Paluxy soils. These soils make up less than 20 percent of this map unit.

This Bastrop soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is a savannah of tall and mid grasses with scattered post oak trees and mottes. Management concerns include controlled grazing and brush control.

This soil has medium potential for cultivated crops. Peanuts, grain sorghum, and truck crops are the major crops. Also, fruit and nut trees do well on this soil. Terraces, contour cultivation, and return of crop residues to the soil surface help control erosion, conserve moisture, and maintain productivity. Crops on this soil respond well to fertilizer. The potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly used grasses for this soil.

The potential for most urban uses is high.

This Bastrop soil is in capability subclass IIIe and in Sandy Loam range site.

5—Bastrop fine sandy loam, 1 to 5 percent slopes, eroded. This deep, gently sloping soil is on stream terraces. Areas are irregular in shape and range from 5 to 50 acres. Slopes are plane to convex and average 3 percent.

Typically, the surface layer is reddish brown, slightly acid fine sandy loam about 4 inches thick. From 4 inches to about 80 inches is sandy clay loam that is reddish brown and slightly acid in the upper part, yellowish red and neutral in the middle part, and light reddish brown and moderately alkaline in the lower part.

This soil is well drained. Permeability is moderate and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep, and easily penetrated by roots. The water erosion and the soil blowing hazards are moderate.

Included in mapped areas of this soil are small areas of Minwells and Paluxy soils. These soils make up less than 20 percent of this map unit.

Potential of this Bastrop soil for cultivated crops is medium and this is the main use. Peanuts, grain sorghum, and truck crops are the major crops. Also, fruit and nut trees grow well on this soil. Terraces, contour cultivation, and the return of crop residues to the soil surface help control erosion, conserve moisture, and maintain productivity. Crops on this soil respond well to fertilizer. The potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the common grasses grown on this soil.

This soil has high potential for growing native range plants. The climax plant community is a savannah of tall and mid grasses with scattered post oak trees and mottes. Management includes controlled grazing, proper stocking, and brush control.

Many areas have shallow gullies or rills 75 to 100 feet apart and several inches deep. The potential for most urban uses is high.

This Bastrop soil is in capability subclass IIIe and in Sandy Loam range site.

6—Bolar clay loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on convex uplands. Areas are irregular in shape and range from 15 to 50 acres. Slopes are convex and average 2 percent.

Typically, the surface layer is calcareous clay loam about 15 inches thick that is brown in the upper part and very dark grayish brown in the lower part. From 15 to 31 inches is calcareous clay loam that is pale brown in the upper part and yellowish brown in the lower part. From 31 to 37 inches is yellowish brown, calcareous clay loam interbedded with limestone fragments. Limestone bedrock is at a depth of 37 inches.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is moderately deep and easily penetrated by plant roots. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Brackett, Purves, and Tarrant soils. They make up less than 20 percent of this map unit.

This Bolar soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Woody plants are not significant in the climax vegetation. Management includes proper stocking, controlled grazing, and brush control.

This soil has medium potential for cultivated crops. Grain sorghum, forage sorghum, and small grains are the main crops. Terraces and contour cultivation help to control erosion. Residues from crops left on the soil surface help to conserve moisture, maintain tilth, and maintain productivity. Potential for pasture plants is medium. Bermudagrass and kleingrass are the commonly used grasses on this soil.

The potential for most urban uses is medium. The depth to rock is a limitation difficult to overcome. Low strength is the main limitation for local roads and streets.

This Bolar soil is in capability subclass IIe and in Clay Loam range site.

7—Bolar clay loam, 3 to 5 percent slopes. This moderately deep, gently sloping soil is on convex uplands. Areas are irregular in shape and range from 5 to 40 acres. Slopes are convex and average 4 percent.

Typically, the surface layer is calcareous clay loam about 14 inches thick that is brown in the upper part and dark brown in the lower part. From 14 to 34 inches is calcareous clay loam. This layer is pale brown in the upper part and yellowish brown in the lower part with many limestone fragments. Indurated limestone bedrock is at a depth of 34 inches.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is moderately deep and easily penetrated by plant roots. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Brackett, Purves, and Tarrant soils. They make up less than 20 percent of this map unit.

This Bolar soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Woody plants are not significant in the climax vegetation. Management includes proper stocking, controlled grazing, and brush control.

This soil has medium potential for cultivated crops. Grain sorghum, forage sorghum, and small grains are the main crops. Terraces and contour cultivation help to control erosion. Residues from crops left on the soil surface help to conserve moisture, maintain tilth, and maintain productivity. Potential for pasture plants is medium. Bermudagrass and kleingrass are the commonly used grasses on this soil.

The potential for most urban uses is medium. The depth to rock is a limitation that is difficult to overcome. Low strength is the main limitation for local roads and streets.

This Bolar soil is in capability subclass IIIe and in Clay Loam range site.

8—Bosque loam, occasionally flooded. This deep, nearly level soil is on flood plains of major streams. These areas are long and narrow and range from 5 to 300 acres. These soils are flooded briefly about once every 2 to 5 years. Slopes are less than 1 percent.

Typically, the surface layer is a loam about 26 inches thick. It is brown in the upper part and dark grayish brown in the lower part. From 26 to about 63 inches, it is pale brown loam that is light yellowish brown in the lower part. This soil is calcareous throughout.

This soil is well drained. Permeability is moderate, and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion hazard and the soil blowing hazard are slight.

Included in mapped areas of this soil are small areas of Frio and Sunev soils. They make up less than 20 percent of this map unit.

Potential of this Bosque soil for cultivated crops is high. Grain sorghum, cotton, small grains, and forage sorghum are major crops. Potential for pecan trees is high. Residues from crops left on the soil surface help conserve moisture, maintain tilth, and maintain productivity. Crops on this soil respond well to fertilizer. Potential for pasture plants is high. Improved grasses such as bermudagrass and kleingrass are the commonly used grasses on this soil.

This soil has high potential for native range plants. The climax plant community is a tall grass savannah with 10 to 15 percent canopy of trees. The trees, along with adequate food, primarily from seeds, provide wildlife habitat for turkey and squirrel. Management concerns include proper stocking, controlled grazing, and brush control.

Flooding is the main limitation for most urban uses.

This Bosque soil is in capability subclass IIw and in Loamy Bottomland range site.

9—Brackett gravelly clay loam, 1 to 5 percent slopes. This shallow, gently sloping soil is on convex uplands. Areas are irregular in shape and range from 10 to 75 acres.

Typically, the surface layer is dark grayish brown, calcareous gravelly clay loam about 6 inches thick. The next layer from 6 to 17 inches is yellowish brown, calcareous, gravelly clay loam. The next layer from 17 to 60 inches is limestone interbedded with strata of clay loam and limestone fragments.

This soil is well drained. Permeability is moderately slow, and available water capacity is very low. The root zone is restricted by shallow depth over rock. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Bolar, Maloterre, Purves, and Tarrant soils. They make up less than 20 percent of this map unit.

Potential of this Brackett soil for cultivated crops is low, and this is the main use. This soil does not respond well to commercial fertilizers. The high lime content of this soil causes fertilizer elements to be held in forms unavailable for plant use. Potential for growing pasture plants is low. The gravelly and stony layers restrict cultivation. The root zone is restricted because of shallow depth over rock.

This soil has medium potential for native range plants. The climax plant community is a mixture of tall, mid, and short grasses with Texas oak and live oak scattered throughout. Management includes proper stocking, controlled grazing, and brush control.

The potential for urban uses is low. Depth to rippable rock and high corrosivity are limitations that affect urban use.

This Brackett soil is in capability subclass IVe and in Adobe range site.

10—Brackett-Eckrant association, hilly. This association consists of very shallow and shallow soils, on stony

hillsides. Slopes range from 8 to 40 percent. These areas are irregular in shape and range from 20 to 1,500 acres.

Brackett and closely similar soils make up about 45 percent of this association, Eckrant and closely similar soils about 25 percent, exposed limestone bedrock about 15 percent, and other soils about 15 percent. The Brackett soils occupy the lower parts of the hill slopes and the Eckrant soils and rock outcrop are on the upper parts of the hill slopes. These soils could be separated, but use and management are similar.

Typically, the surface layer of Brackett soil is light brownish gray, calcareous, gravelly clay loam about 8 inches thick. From 8 to 15 inches is a light yellowish brown, calcareous clay loam about 7 inches thick. From 15 to 60 inches is interbedded clay loams and limestone fragments with pockets of calcium carbonates.

Soils closely similar to Brackett include a soil that has a darker surface layer and a soil that is 20 to 30 inches to bedrock.

The Brackett soil is well drained. Permeability is moderately slow, and available water capacity is very low. Water erosion hazard is severe. Soil blowing hazard is slight.

The surface layer of Eckrant soil about 10 inches thick is very dark gray, noncalcareous cobbly clay containing 40 to 60 percent cobbles and fragments of limestone.

Soils closely similar to Eckrant include a soil that is calcareous to the surface, and a soil that has 10 to 35 percent gravel.

The Eckrant soil is well drained. Permeability is moderately slow, and available water capacity is very low. The water erosion hazard is severe. The soil blowing hazard is slight.

Other soils and limestone bedrock make up as much as 30 percent of the association. The soils are small areas of Bolar, Cranfill, Maloterre, and Purves. The Bolar soils are mainly on lower slopes. The Cranfill, Maloterre, and Purves soils are intermingled throughout the association. The limestone bedrock outcrops in small areas mainly near crests of hills and ridges, or as narrow bands on mid slopes.

These Brackett and Eckrant soils are used mainly as rangeland. Potential for native range plants is low (fig. 1).

The climax plant community is a mixture of mid and short grasses with Texas oak scattered throughout. Management includes proper stocking, controlled grazing, and brush control. Potential for deer habitat is high.

These soils have low potential for crops, pasture, and urban uses. The stones, shallow depth to rippable rock, and slope are limitations that affect these uses. Most areas of this association have esthetic qualities that make them desirable for homesites to the point that overcoming the limitations is worthwhile.

These soils are in capability subclass VIIs; Brackett soil is in Steep Adobe range site, and Eckrant soil is in Steep Rocky range site.

11—Cranfill gravelly clay loam, 3 to 5 percent slopes. This deep, gently sloping soil is on convex foot slopes. Areas are irregular in shape and range from 30 to several hundred acres.

Typically, this soil is calcareous gravelly clay loam to about 80 inches. The upper part is grayish brown, the middle is light yellowish brown, and the lower part is very pale brown (fig. 2).

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The water erosion hazard is moderate. The soil blowing hazard is slight. The root zone is deep and easily penetrated by plant roots.

Included in mapped areas of this soil are small areas of Bolar, Brackett, Seawillow, and Sunev soils. They make up less than 20 percent of this map unit.

This Cranfill soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Management includes proper stocking, controlled grazing, and brush control.

Potential for cultivated crops is medium. Grain sorghum and small grains are the major crops. The high lime content of this soil in the lower layer makes plant nutrients unavailable and sometimes reduces yields. Terraces and contour cultivation help reduce erosion. Plant residues left on the soil surface also help reduce erosion, conserve moisture, and maintain soil productivity. Potential for pasture plants is medium. Kleingrass is the grass commonly grown on this soil.

Potential for most urban uses is high.

This Cranfill soil is in capability subclass IIIe and in Clay Loam range site.

12—Cranfill gravelly clay loam, 3 to 5 percent slopes, eroded. This deep, gently sloping soil is on convex foot slopes. Areas are irregular in shape and range from 10 to 100 acres. Erosion has removed part of the surface layer. Many cultivated areas have shallow gullies or rills that are 75 to 100 feet apart and several inches deep.

Typically, this soil is calcareous gravelly clay loam to about 80 inches. The upper part is grayish brown and the lower part is very pale brown.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The water erosion hazard is moderate. The soil blowing hazard is slight. The root zone is deep and easily penetrated by plant roots.

Included in mapped areas of this soil are small areas of Bolar, Brackett, Seawillow, and Sunev soils. They make up less than 20 percent of this map unit.

This Cranfill soil is used mainly as rangeland. Potential for native range plants is high. The climax plant commu-

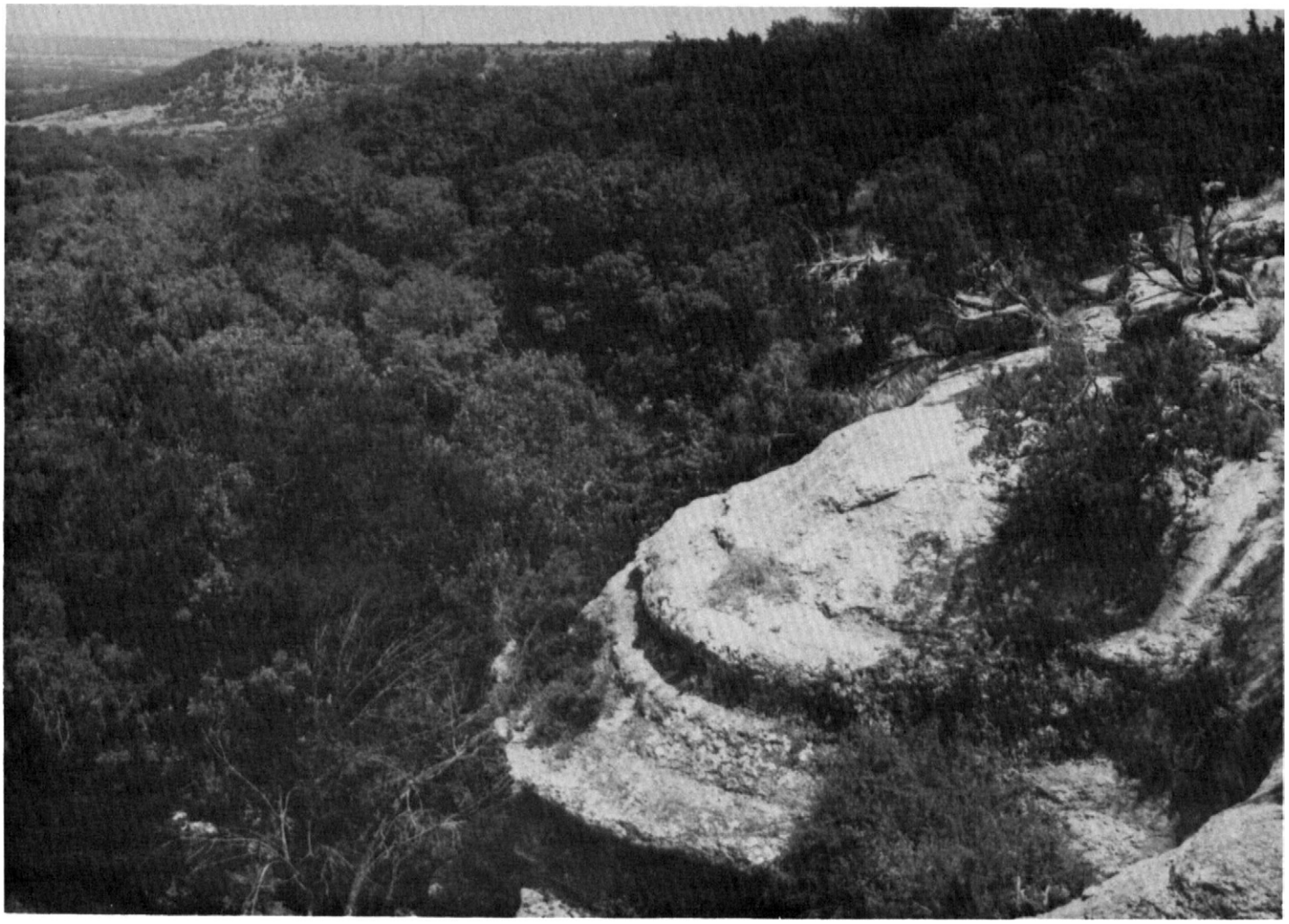


Figure 1.—The native trees and plants provide wildlife habitat on Brackett-Eckrant association, hilly.

nity is an open prairie supporting an abundant growth of mid and tall grasses. Management includes proper stocking, controlled grazing, and brush control.

Potential for cultivated crops is medium. Grain sorghum and small grains are the major crops. The high lime content of the lower layers of this soil affects the availability of some nutrients and occasionally reduces yields. Terraces and contour cultivation help reduce erosion. Plant residues left on the soil surface also help reduce erosion, conserve moisture, and maintain soil productivity. Potential for pasture plants is medium. Kleingrass is the commonly grown grass on this soil.

Potential for most urban uses is high.

This Cranfill soil is in capability subclass IIIe and in Clay Loam range site.

13—Cranfill gravelly clay loam, 5 to 8 percent slopes. This deep, gently sloping soil is on convex foot slopes. Areas are irregular in shape and range from 20 to several hundred acres.

Typically, this soil is calcareous gravelly clay loam to about 80 inches. The upper part is dark grayish brown, the middle is yellowish brown, and the lower part is very pale brown.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The water erosion hazard is moderate. The soil blowing hazard is slight. The root zone is deep and easily penetrated by plant roots.

Included in mapped areas of this soil are small areas of Bolar, Brackett, Seawillow, and Sunev soils. They make up less than 20 percent of this map unit.

This Cranfill soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of

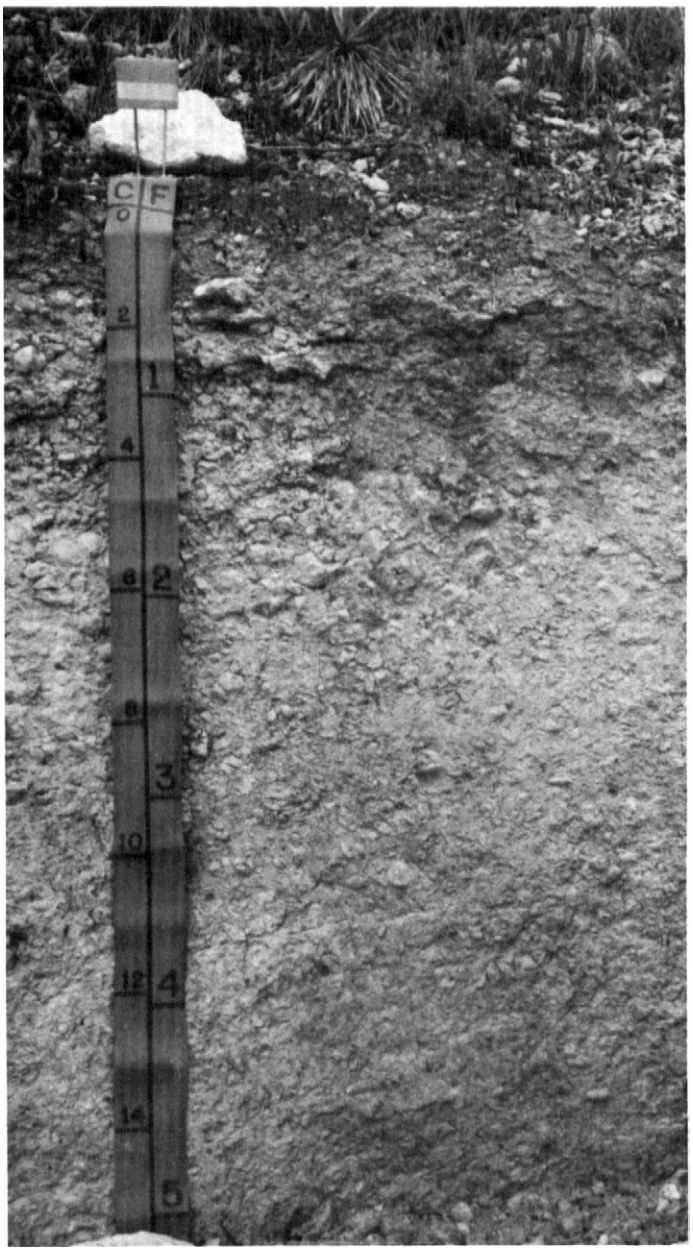


Figure 2.—Profile of Cranfill gravelly clay loam, 3 to 5 percent slopes; high lime content ties up plant nutrients and sometimes reduces crop yields. Multiply the figure on the left by 10 to determine the depth in centimeters.

tall and mid grasses. Management includes proper stocking, controlled grazing, and brush control.

Potential for cultivated crops is medium. Slope is a limitation that reduces choice of crops. Close-sown forage sorghums and small grains are grown in some areas. Terraces, diversions, and use of plant residues help control erosion, conserve moisture, and maintain soil productivity. Potential for pasture plants is medium. Kleingrass is the grass commonly grown on this soil.

Potential for most urban uses is high.

This Cranfill soil is in capability subclass IVe and in Clay Loam range site.

14—Cranfill gravelly clay loam, 5 to 8 percent slopes, eroded. This deep, sloping soil is on convex foot slopes. Areas are irregular in shape and range from 10 to 60 acres. Erosion has reduced the surface layer to 1/2 to 1/3 of its original thickness. In cultivated areas, the upper part of the subsoil has been mixed with the surface layer by tillage. Many areas have shallow gullies and rills 75 to 100 feet apart and several inches deep.

Typically, this soil is calcareous, gravelly clay loam to about 80 inches. The upper 6 inches is dark grayish brown, the next 18 inches is brown, and the rest is very pale brown.

This soil is well drained. Permeability is moderate, and available water capacity is medium. The water erosion hazard is moderate. The soil blowing hazard is slight. The root zone is deep and easily penetrated by plant roots.

Included in mapped areas of this soil are small areas of Bolar, Brackett, Seawillow, and Sunev soils. They make up less than 20 percent of this map unit.

This Cranfill soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Management includes proper stocking, controlled grazing and brush control.

This soil is not suitable for cropland. Potential for pasture plants is medium. Kleingrass is the main grass grown on this soil.

Potential for most urban uses is high.

This Cranfill soil is in capability subclass VIe and in Clay Loam range site.

15—Cranfill gravelly clay loam, 3 to 8 percent slopes, severely eroded. This deep, gently sloping and sloping soil is on severely eroded foot slopes. Areas are irregular in shape and range from 10 to 100 acres. Gullies ranging from 10 to 15 feet in depth and 15 to 20 feet in width occur at about 40-foot intervals. The surface layer has been removed from most areas between the gullies. In some places, the upper part of the subsoil has been removed. The soil areas have no regular sizes or shapes.

Typically, this soil is calcareous gravelly clay loam to about 80 inches. The upper 5 inches is grayish brown, the middle, from 5 to 28 inches is brown, and the rest is very pale brown.

This soil is well drained. Permeability is moderate, and available water capacity is medium. The water erosion hazard is severe. The soil blowing hazard is slight. The root zone is deep and easily penetrated by plant roots.

Included in mapped areas of this soil are small areas of Bolar, Brackett, Seawillow, and Sunev soils. They make up less than 20 percent of this map unit.

This Cranfill soil is used mainly as rangeland. Potential for rangeland production is high. The climax plant com-

munity is an open prairie supporting an abundant growth of tall and mid grasses. Management includes proper stocking, controlled grazing, and brush control.

This soil is not suitable for cropland. Potential for pasture plants is low. The gullies can be smoothed and shaped and then established to bermudagrass to control further erosion.

The potential for most urban uses is low.

This Cranfill soil is in capability subclass VIe and in Clay Loam range site.

16—Crawford clay, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands. Areas are irregular in shape and range from 10 to 100 acres.

Typically the surface layer is brown, neutral clay about 15 inches thick. From 15 to 26 inches is dark reddish brown, neutral clay. The underlying layer is limestone bedrock.

This soil is well drained. Permeability is very slow, and available water capacity is low. The water erosion hazard is moderate. The soil blowing hazard is slight. This soil can be worked only over a narrow range of moisture content.

Included with mapped areas of this soil are small areas of Denton, Eckrant, and Tarpley soils. They make up less than 20 percent of this map unit.

Potential of this Crawford soil for cultivated crops is high, and this is the main use. Grain sorghum, cotton, and small grains are the major crops. Terraces and contour cultivation help to control erosion. Residues from crops left on the soil surface help conserve moisture, slow runoff, reduce soil temperature, and maintain soil tilth and productivity. Potential is high for pasture plants. Such grasses as bermudagrass, kleingrass, and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of mid and tall grasses. Management includes controlled grazing, proper stocking, and brush control.

This soil has medium potential for most urban uses. The shrink-swell potential, depth to hard rock, and very slow permeability are limitations. Low strength is the main limitation for local roads and streets.

This Crawford soil is in capability subclass IIIe and in Deep Redland range site.

17—Denton silty clay, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands. Areas are irregular in shape and range from 10 to 200 acres. Slopes are plane to slightly concave.

Typically, the surface layer is a dark grayish brown calcareous silty clay about 5 inches thick. From 5 to 36 inches is brown calcareous silty clay. From 36 to 40 inches is brown silty clay that has many limestone fragments. The underlying layer is limestone bedrock.

This soil is well drained. Permeability is slow, and available water capacity is medium. This soil can be worked only over a narrow range of moisture content. The soil is very sticky and plastic when wet and has deep surface cracks when dry. The root zone is restricted by the moderate depth to rock. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Bolar, Krum, Purves, and Sunev soils. They make up less than 20 percent of this map unit.

This Denton soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, cotton, and small grains are the major crops. Terraces and contour cultivation help to control erosion. Residues from crops left on the soil surface help conserve moisture, slow runoff, reduce soil temperature, and maintain soil tilth and productivity. Potential is high for pasture plants. Such grasses as bermudagrass, kleingrass, and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses (fig. 3). Woody plants are not significant in the climax vegetation. Management includes controlled grazing, proper stocking, and brush control.

This soil has a medium potential for most urban uses. The shrink-swell potential, depth to rippable rock, and slow permeability are limitations. Low strength is the main limitation for local roads and streets.

This Denton soil is in capability subclass IIe and in Clay Loam range site.

18—Denton silty clay, 3 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands. Areas are irregular in shape and range from 5 to 40 acres.

Typically, the surface layer is dark grayish brown calcareous silty clay about 6 inches thick. The next layer from 6 to 30 inches is brown, calcareous silty clay. From 30 to 35 inches is brown silty clay that has many flaggy limestone fragments. Below is indurated limestone bedrock.

This soil is well drained. Permeability is slow, and available water capacity is medium. This soil can be worked only over a narrow range of moisture content. This soil is very sticky and plastic when wet and has wide surface cracks when dry. The root zone is restricted by the moderate depth to rock. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Bolar, Krum, Purves, and Sunev soils. They make up less than 20 percent of this map unit.

This Denton soil is used mainly as cropland. Potential for cultivated crops is medium. Grain sorghum, cotton, and small grains are the major crops. Terraces and contour cultivation help control erosion. Residues from crops left on the soil surface help conserve moisture, slow runoff, reduce soil temperature, and maintain soil productivity and tilth. Potential is medium for pasture plants.

Figure 3.—Potential for pasture is high on Denton silty clay, 1 to 3 percent slopes. Also, the indiangrass and trees provide wildlife habitat.

Such grasses as bermudagrass, kleingrass, and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Woody plants are not significant in the climax vegetation. Management includes controlled grazing, proper stocking, and brush control.

The potential for most urban uses is medium. The shrink-swell potential, depth to rippable rock, and slow permeability are limitations that must be overcome in design of structures. Low strength is the main limitation for local roads and streets.

This Denton soil is in capability subclass IIIe and in Clay Loam range site.

19—Duffau fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is brown, slightly acid fine sandy loam about 11 inches thick. The next layer from 11 to about 60 inches is slightly acid sandy clay loam that is yellowish red in the upper part and reddish yellow in the lower part. From 60 to 68 inches is reddish yellow, neutral fine sandy loam.

This soil is well drained. Permeability is moderate, and available water capacity is high. Crops on this soil respond well to fertilizer. The range in moisture content at which this soil can be best worked is narrow. The root zone is deep. The water erosion hazard is moderate. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Selden and Windthorst soils. They make up less than 20 percent of this map unit.

This Duffau soil is used mainly as cropland. Potential for cultivated crops is medium. Grain sorghum and truck crops do well on this soil. Terraces and contour cultivation help reduce erosion. Plant residues left on the soil surface help conserve moisture, reduce runoff, and maintain soil productivity. Potential for pasture plants is high. Kleingrass, bermudagrass, and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a mixture of mid and short grasses and forbs. Management includes controlled grazing, proper stocking and brush control.

Potential for most urban uses is medium. Shrink-swell is the main limitation that is easily overcome by proper design. Low strength is the main limitation for local roads and streets.

This Duffau soil is in capability subclass IIe and in Sandy Loam range site.

20—Duffau fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on plane to convex uplands. Areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is fine sandy loam about 10 inches thick that is dark grayish brown in the upper part and pale brown in the lower part. From 10 to about 60 inches is yellowish red sandy clay loam that is reddish yellow in the lower part. This soil is slightly acid throughout.

This soil is well drained. Permeability is moderate, and available water capacity is high. Crops on this soil respond well to fertilizer. The range in moisture content at which this soil can be best worked is narrow. The root zone is deep, but some plant roots are restricted by the clayey lower layers. The water erosion hazard is moderate. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Selden and Windthorst soils. They make up less than 20 percent of this map unit.

This Duffau soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is a mixture of mid and short grasses and forbs. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops is medium. Grain sorghum is suited to this soil. Terraces and contour cultivation help control erosion. Plant residues left on the soil surface help conserve moisture, regulate soil temperature, and maintain productivity and tilth. Potential for pasture plants is high. Kleingrass, bermudagrass, and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for most urban uses is medium. Shrink-swell is the main limitation. Low strength is the main limitation for local roads and streets.

This Duffau soil is in capability subclass IIIe and in Sandy Loam range site.

21—Duffau fine sandy loam, 1 to 5 percent slopes, eroded. This deep, gently sloping soil is on convex uplands. Areas are irregular in shape and range from 5 to 50 acres. Sheet erosion has removed on the average about 75 percent of the original surface layer. An occasional shallow gulley, about 12 inches deep, occurs in places, but these are crossable with farm machinery. Some areas have a sandy clay loam surface layer because parts of the sandy clay loam subsoil have been incorporated with the surface layer by tillage.

Typically, the surface layer is dark grayish brown, slightly acid fine sandy loam about 3 inches thick. From 3 to about 60 inches is slightly acid, yellowish red sandy clay loam that is reddish yellow in the lower part.

This soil is well drained. Permeability is moderate, and available water capacity is high. Crops on this soil respond well to fertilizer. The root zone is deep. The water erosion hazard is moderate. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Selden and Windthorst soils. They make up less than 20 percent of this map unit.

This Duffau soil is used mainly as cropland. Potential for cultivated crops is medium. Grain sorghum, truck crops, and peanuts do well on this soil. Terraces, contour cultivation, and plant residues left on the soil surface help control erosion, conserve moisture, and maintain productivity. Potential for pasture plants is high. Kleingrass, bermudagrass, and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a mixture of mid and short grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is medium. Shrink-swell is the main limitation that can be overcome by proper design. Low strength is the main limitation for local roads and streets.

This Duffau soil is in capability subclass IIIe and in Sandy Loam range site.

22—Eckrant association, gently undulating. This shallow and very shallow soil is on uplands. Slopes range from 1 to 5 percent. These areas are irregular in shape and range from 15 to several hundred acres.

About 85 percent of this map unit is Eckrant and closely similar soils, and 15 percent is other soils and limestone outcrop. These closely similar soils could be separated, but because use and management are similar it is not justified.

Typically, the surface layer of Eckrant soils is very dark gray, cobbly clay about 10 inches thick. About one-half of this layer is cobbles and fragments of limestone over 3 inches in diameter. Underlying material is fractured, indurated limestone bedrock. Soils closely similar to Eckrant include a soil that is calcareous to the surface, a soil that has 10 to 35 percent gravel, and a soil that is 20 to 30 inches to bedrock.

The Eckrant soil is well drained. Permeability is moderately slow, and available water capacity is very low. The root zone is restricted because of shallow and very shallow depths to rock. The water erosion hazard is severe. The soil blowing hazard is slight.

Other soils in this map unit are small areas of Bolar, Cranfill, and Tarrant. The limestone outcrops are mainly on crests of ridges. These soils and limestone outcrops make up about 15 percent of the association.

This map unit is used as rangeland. Potential for native range plants is low. The climax plant community is an open tall and mid grass prairie with live oak scattered throughout (fig. 4). Management includes controlled grazing, proper stocking, and brush control.

This unit is not suited to cultivated crops. Potential for pasture and urban uses is low. Stones and depth to rock are limitations that are diffucult to overcome.

Figure 4.—Low Stony Hills range site on Eckrant association, gently undulating, has low potential for native range plants.

This Eckrant and closely similar soils are in capability subclass VIIs and in Low Stony Hills range site.

23—Frio silty clay loam, occasionally flooded. This deep, nearly level soil is on bottom lands. Slopes are less than 1 percent. Areas are irregular in shape, lie along streams, and range from 10 to 1,500 acres. These soils are flooded briefly about once every 2 to 5 years.

Typically, the surface layer is dark grayish brown, calcareous, silty clay loam about 5 inches thick. The underlying layer to about 63 inches is very dark brown, calcareous silty clay that is grayish brown in the lower part.

This is a well drained soil. Permeability is moderately slow, and available water capacity is high. The root zone is deep and easily penetrated by plant roots. This soil can be worked over a wide range of moisture content. This soil is very sticky and plastic when wet. The water erosion hazard is slight. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Bosque and Sunev soils. They make up less than 20 percent of this map unit.

This Frio soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, corn, cotton, and small grains are the major crops (fig. 5). Crop residue left on the soil surface helps conserve moisture and maintain tilth and productivity. Potential for pasture plants is high. Such grasses as bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a tall grass savannah with 10 to 15 percent canopy of tall trees. Management includes controlled grazing, proper stocking, and brush control.

Flooding is a limitation for urban uses.

This Frio soil is in capability subclass IIw and in Loamy Bottomland range site.

24—Hassee fine sandy loam, 0 to 2 percent slopes. This deep, nearly level to gently sloping soil is on uplands. Areas are oval to oblong in shape and range from 5 to 50 acres.

Typically, the surface layer is slightly acid fine sandy loam about 14 inches thick. The upper part is grayish brown and the lower part is light grayish brown.

From 14 to 36 inches is dark grayish brown, neutral clay. From 36 to 48 inches is grayish brown, calcareous clay. From 48 to 60 inches the soil is light gray, calcareous clay loam that has many masses and concretions of calcium carbonate.

This soil is very slowly permeable, and available water capacity is high. This soil is somewhat poorly drained. Some small nearly level areas are ponded following extended rainfall. This soil has a hard crust on the surface

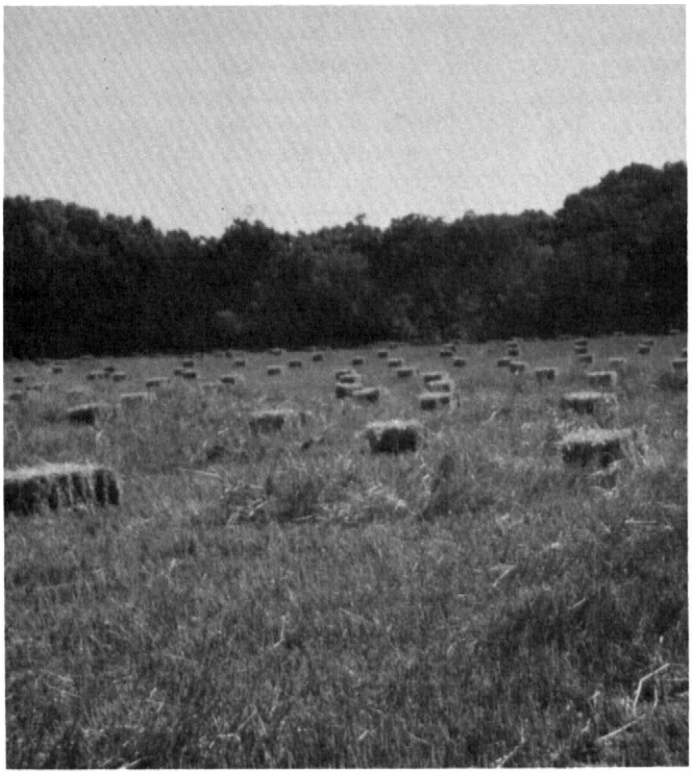


Figure 5.—Oats, a major crop in the county, grown and baled for hay on Frio silty clay loam, occasionally flooded.

when dry. Tillage of this soil is satisfactory only over a narrow range of moisture conditions. It has a deep root zone, but the blocky clay lower layers hamper plant root penetration. The water erosion hazard is slight. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Bastrop, Minwells, Paluxy, and Windthorst soils. They make up less than 20 percent of this map unit.

This Hassee soil is used mainly as rangeland. Potential for native range plants is medium. The climax plant community is an open mid and short grass prairie. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops is medium. Small grains and forage sorghum are the major crops. Terraces and contour cultivation help control erosion. Residues from crops left on the soil surface help conserve moisture, reduce runoff, and maintain tilth. The potential for pasture is medium. King Ranch bluestem grass is the commonly grown grass on this soil.

Potential for most urban uses is low. Wetness, very slow permeability, and shrink-swell potential are limitations that are difficult to overcome.

This Hassee soil is in capability subclass IIIe and in Claypan Prairie range site.

25—Krum clay, 0 to 1 percent slopes. This deep, nearly level soil is on stream terraces. Areas are irregular to oval in shape and range from 20 to 100 acres.

Typically, the surface layer is dark grayish brown, calcareous clay about 6 inches thick. The next layer, from 6 to 28 inches, is very dark grayish brown, calcareous clay. From 28 to 72 inches is calcareous clay that has a few soft masses and concretions of calcium carbonate. This layer is brown in the upper part and brownish yellow in the lower part.

This soil is well drained. Permeability is moderately slow, and available water capacity is medium. This soil can be worked over a narrow range of moisture content. The soil is sticky and plastic when wet and has deep surface cracks when dry. The root zone is deep, but the clayey layers partly restrict root penetration. The water erosion hazard and the soil blowing hazard are slight.

Included in mapped areas of this soil are small areas of Crawford, Denton, Purves, Slidell, and Sunev soils. They make up less than 20 percent of this map unit.

This Krum soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, cotton, corn, and small grains are the main crops for this soil. Residues from crops left on the soil surface help conserve moisture, improve tilth and maintain productivity. This soil can be worked over a narrow range of moisture content. Potential for pasture plants is high. Kleingrass is the commonly grown grass on this soil.

Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is low. The shrink-swell potential and moderately slow permeability are limitations that are difficult to overcome. Low strength is the main limitation for local roads and streets.

This Krum soil is in capability subclass IIs and in Clay Loam range site.

26—Krum clay, 1 to 3 percent slopes. This deep, gently sloping soil is on stream terraces. Areas are irregular in shape and range from 20 to 800 acres.

Typically, the surface layer is dark grayish brown, calcareous clay about 5 inches thick. The next layer, from 5 to 22 inches, is very dark grayish brown, calcareous silty clay. From 22 to 63 inches is calcareous silty clay that is brown in the upper part and brownish yellow in the lower part which has common concretions of calcium carbonate.

This soil is well drained. Permeability is moderately slow, and available water capacity is medium. This soil can be worked over a narrow range of moisture content. The soil is sticky and plastic when wet and has deep surface cracks when dry. The root zone is deep, but the clayey layers partly restrict root penetration. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Crawford, Denton, Purves, Slidell, and Sunev soils. They make up less than 20 percent of this map unit.

This Krum soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, cotton, corn, and small grains are the main crops for this soil. Terraces and contour cultivation help control erosion. Residues from crops left on the surface reduce runoff, conserve moisture, improve tilth, and maintain productivity. This soil can be worked over a narrow range of moisture content. The potential for pasture plants production is high. Such grasses as kleingrass and King Ranch bluestem are the commonly grown grasses on this soil.

The potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is low. The shrink-swell potential and moderately slow permeability are limitations that are difficult to overcome. Low strength is the main limitation for local roads and streets.

This Krum soil is in capability subclass IIe and in Clay Loam range site.

27—Maloterre-Tarrant complex, 1 to 8 percent slopes. This soil complex consists of shallow and very shallow, gently sloping soils on convex low knolls on uplands. Areas are irregular in shape and range from 10 to several hundred acres.

About 65 percent of this map unit is Maloterre and closely similar soils, 20 percent Tarrant and closely similar soils, 10 percent rock outcrop, and about 5 percent other soils. Areas of these soils are so intricately mixed that mapping them separately was not practical at the scale mapped.

Typically, the Maloterre soil surface layer, about 5 inches thick, is dark grayish brown, calcareous gravelly clay loam that has many limestone shells and fragments. Below 5 inches is indurated limestone containing interbedded shell fossils. Closely similar very shallow soils include a soil that has a darker surface layer, a very gravelly soil, and a clayey soil.

The Maloterre soil is somewhat excessively drained. Permeability is moderately slow, and available water capacity is very low. The root zone is severely restricted because of very shallow and shallow depths over rock. The water erosion hazard is severe. The soil blowing hazard is slight.

Typically, the Tarrant soil is a calcareous cobbly clay about 12 inches thick. It is very dark grayish brown in the upper 6 inches and brown in the lower part. The underlying material is fractured, indurated, platy limestone bedrock. Closely similar soils include a soil that has a lighter colored surface layer, a soil that has only a few limestone cobbles, and a soil that is 20 to 36 inches to bedrock.

The Tarrant soil is well drained. Permeability is moderately slow, and the available water capacity is very low. The root zone is severely restricted by shallow and very shallow depths over rock. The water erosion hazard is severe. The soil blowing hazard is slight.

Other soils intermingled in small areas are Bolar and Purves which make up about 5 percent. Small areas of rock outcrop are on the crests of knolls and make up 10 percent of the association.

This unit is used mainly as rangeland. Potential for native plants is low (fig. 6). The climax plant community is an open tall and mid grass prairie with live oak scattered throughout. Management includes controlled grazing, proper stocking, and brush control.

This soil is not suitable for crops. Potential for pasture and urban uses are low. Stones and depth to hard rock are limitations that are difficult to overcome.

These Maloterre and Tarrant soils are in capability subclass VIIs; Maloterre soil is in Very Shallow range site; and Tarrant soil is in Low Stony Hills range site.

28—Minwells fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on plane to convex stream terraces. Areas are irregular in shape and range from 10 to 50 acres.

Typically, the surface layer is reddish brown, slightly acid fine sandy loam about 6 inches thick. The next layer about 8 inches thick is light brown, slightly acid fine sandy loam. From 14 to 36 inches the soil is red, slightly acid sandy clay. From 36 to 80 inches is reddish brown, moderately alkaline gravelly sandy clay loam that is yellowish red in the lower part.

This soil is well drained. Permeability is slow, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion and the soil blowing hazard are moderate.

Included in mapped areas of this soil are small areas of Bastrop and Paluxy soils. They make up less than 20 percent of this map unit.

This Minwells soils is used mainly as cropland. Potential for cultivated crops is medium. Peanuts, grain sorghum, and truck crops are the major crops. Fruit and nut trees grow well on this soil. Terraces, contour cultivation, and return of crop residues to the soil surface help control erosion, conserve moisture, and maintain productivity. Crops on this soil respond well to fertilizer. The potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a savannah with tall and mid grasses and scattered post oak trees and mottes. Major management includes controlled grazing, proper stocking, and brush control.

The potential for most urban uses is high.

This Minwell soil is in capability subclass IIe and Sandy Loam range site.

Figure 6.—Tall and mid grasses with scattered live oak on Maloterre soil in an area of Maloterre-Tarrant complex, 1 to 8 percent slopes.

29—Minwells fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on plane to convex stream terraces. Areas are irregular in shape and range from 10 to 50 acres.

Typically the surface layer is brown fine sandy loam about 6 inches thick. From 6 to 14 inches is light brown fine sandy loam. From 14 to 50 inches is red sandy clay. From 50 to 80 inches is reddish brown, gravelly, sandy clay loam. This soil is slightly acid throughout.

This soil is well drained. Permeability is slow, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion and the soil blowing hazard are moderate.

Included in mapped areas of this soil are small areas of Bastrop and Paluxy soils. They make up less than 20 percent of this map unit.

This Minwells soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is a savannah of tall and mid grasses with scattered post oak trees and mottes. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops is medium. Peanuts, grain sorghum, and truck crops are the major crops. Fruit and nut trees also grow well on this soil. Terraces, contour cultivation, and return of crop residues to the soil surface help control erosion, conserve moisture, and maintain productivity. Crops on this soil respond well to fertilizer. Potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

The potential for most urban uses is high.

This Minwell soil is in capability subclass IIIe and in Sandy Loam range site.

30—Minwells fine sandy loam, 1 to 5 percent slopes, eroded. This deep, gently sloping soil is on stream terraces. Erosion has thinned the surface layer to 1/2 to 1/3 of its original thickness. In cultivated areas, sandy clay loam from the subsoil has been mixed with the original surface layer of fine sandy loam by tillage. Many areas have shallow gullies or rills 75 to 100 feet apart and several inches deep. Areas are irregular in shape and range from 10 to 80 acres.

Typically, the surface layer is brown fine sandy loam about 3 inches thick. The next layer is light brown fine sandy loam about 8 inches thick. From 11 to 47 inches is red sandy clay. From 47 to 80 inches is reddish brown gravelly sandy clay loam. This soil is slightly acid in the upper part and moderately alkaline in the lower.

This soil is well drained. Permeability is slow, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion and the soil blowing hazard are moderate.

Included in mapped areas of this soil are small areas of Bastrop and Paluxy soils. They make up less than 20 percent of this map unit.

This soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community

is a savannah of tall and mid grasses with scattered post oak trees and mottes. Management includes controlled grazing, proper stocking, and brush control.

Most of this soil has been farmed, but some areas of soils are being converted to rangeland or pasture. Potential for cultivated crops is medium. Peanuts, sorghums, and truck crops are the major crops. Fruit and nut trees also grow well on this soil. Terraces, contour cultivation, and return of crop residues to the soil surface help control erosion, conserve moisture, and maintain productivity. Crops on this soil responds well to fertilizer. Potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

The potential for most urban uses is high.

This Minwells soil is in capability subclass IIIe and in Sandy Loam range site.

31—Mosheim silty clay, 1 to 3 percent slopes. This deep, gently sloping soil is on convex uplands. Areas are irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is brown silty clay about 8 inches thick. The next layer is dark brown silty clay about 14 inches thick. From 22 to 48 inches is silty clay that is reddish brown in the upper part and brown in the lower part. Fractured limestone is at a depth of 48 inches. This soil is calcareous throughout (fig. 7).

This soil is well drained. Permeability is slow, and available water capacity is medium. This soil can be worked over a narrow range of moisture content. It is sticky and plastic when wet and has deep surface cracks when dry. The root zone is deep, but the clayey layers restrict plant root penetration. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas are small areas of Bolar, Krum, San Saba, and Searsville soils. They make up less than 20 percent of this map unit.

This Mosheim soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, cotton, corn, and small grains are the major crops. Residues from crops left on the soil surface help conserve moisture, improve tilth, and maintain productivity. Tillage should be limited and timely. Potential for pasture plants is medium. King Ranch bluestem, kleingrass, and bermudagrass are the grasses commonly grown on this soil.

Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

The potential for most urban uses is medium. The shrink-swell potential, slow permeability, and a substratum of rippable bedrock are problems that must be overcome in design. Low strength is the main limitation for local roads and streets.

This Mosheim soil is in capability subclass IIe and in Clay Loam range site.

Figure 7.—A cutbank exposes a profile of Mosheim silty clay, 1 to 3 percent slopes, and shows the underlying limestone.

32—Paluxy very fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on stream terraces. Areas are irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is slightly acid very fine sandy loam about 16 inches thick that is brown in the upper part and reddish brown in the lower part. From 16 to 70 inches the soil is yellowish red very fine sandy loam that is slightly acid in the upper part and neutral in the lower part. From 70 to 80 inches is reddish yellow, moderately alkaline very fine sandy loam.

This soil is well drained. Permeability is moderately rapid, and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is slight. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Bastrop and Minwells soils. They make up less than 10 percent of this map unit.

This Paluxy soil is used mainly as cropland. Potential for cultivated crops is high. Peanuts, grain sorghum, and

truck crops are the major crops. Fruit and nut trees also grow well on this soil. Cover cropping and return of plant residues help control erosion and maintain productivity. Potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a savannah of post oak trees that has an understory of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

The potential for most urban uses is high.

This Paluxy soil is in capability class I and in Sandy Loam range site.

33—Paluxy very fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on stream terraces. Areas are irregular in shape and range from 20 to 100 or more acres.

Typically, the surface layer about 16 inches thick is slightly acid, very fine sandy loam that is brown in the upper part and reddish brown in the lower part. From 16 to 70 inches the soil is yellowish red very fine sandy loam that is slightly acid in the upper part and neutral in the lower part. From 70 to 80 inches is reddish yellow, moderately alkaline very fine sandy loam.

This soil is well drained. Permeability is moderately rapid, and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is slight. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Bastrop and Minwells soils. They make up less than 15 percent of this map unit.

This Paluxy soil is used mainly as cropland. Potential for cultivated crops is medium. Peanuts, sorghum, and truck crops are the major crops. Fruit and nut trees also grow well on this soil. Terraces, contour cultivation, and return of plant residues to the soil surface help control erosion, conserve moisture, and maintain productivity. Potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a savannah of scattered post oak trees and mottes that has an understory of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

The potential for most urban uses is high.

This Paluxy soil is in capability subclass IIe and in Sandy Loam range site.

34—Paluxy very fine sandy loam, 5 to 8 percent slopes. This deep, undulating soil is on stream terraces. Areas are irregular in shape and range from 10 to 50 acres or more.

Typically, the soil is a very fine sandy loam to 80 inches. It is brown and medium acid in the upper part, yellowish red and slightly acid in the middle, and reddish yellow and moderately alkaline in the lower part.

This soil is well drained. Permeability is moderately rapid, and available water capacity is high. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion and the soil blowing hazards are moderate.

Included in mapped areas of this soil are small areas of Bastrop and Minwells soils. They make up less than 15 percent of this map unit.

This soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is a savannah of tall and mid grasses with scattered post oak trees and mottes. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops is medium. The slope of the soil causes an erosion hazard that is difficult to control in cultivated areas. Potential for pasture plants is high. Grasses such as bermudagrass and lovegrass are commonly grown on this soil.

The potential for most urban uses is high.

This Paluxy soil is in capability subclass IVe and in Sandy Loam range site.

35—Pits. Pits are open excavations from which the soil has been removed and the underlying bedrock and gravel have been mined. The pits range from 5 to about 60 acres and from 4 to 40 feet in depth. Materials taken from the pits are mainly limestone, chert, and quartz gravel.

Most of the materials are used for road fill, however, some gravel has been washed and screened for concrete. One company in the county operates a plant that produces several types of lime products.

This unit is not assigned to a capability subclass or range site.

36—Purves clay, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands. Areas are irregular in shape and range from 5 to 120 acres.

Typically, the surface layer is very dark grayish brown clay about 7 inches thick. The next layer is brown clay that has common concretions of calcium carbonate. Indurated limestone is at a depth of 18 inches.

This soil is well drained. Permeability is moderately slow, and available water capacity is very low. This soil can be worked best under a narrow range of moisture content. The root zone is shallow but easily penetrated by plants roots. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Crawford, Denton, Krum, Slidell, and Sunev soils. They make up less than 20 percent of this map unit.

This Purves soil is used mainly as cropland. Potential for cultivated crops is medium. Small grains, cotton, grain sorghum, and forage sorghum are the major crops. Terraces and contour cultivation help control erosion.

Crop residues left on the soil surface help conserve moisture, control erosion, and maintain soil productivity. Potential for pasture plants is low. Kleingrass and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is medium. The climax plant community is an open tall and mid grass prairie that has scattered live oak and hackberry trees. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is low. The depth to rock is a limitation that is difficult to overcome.

This Purves soil is in capability subclass IIIe and in Shallow range site.

37—Purves clay, 3 to 5 percent slopes. This shallow, gently sloping soil is on uplands. Areas are irregular in shape and range from 5 to 40 acres.

Typically, the surface layer is very dark grayish brown clay about 7 inches thick. The next layer to 12 inches is brown clay. From 12 to 15 inches is brown, very gravelly clay. Indurated limestone is at a depth of 15 inches.

This soil is well drained. Permeability is moderately slow, and available water capacity is very low. The soil can be worked best under a narrow range of moisture conditions. The root zone is shallow but easily penetrated by plant roots. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Denton, Sunev, and Tarrant soils. They make up less than 20 percent of this map unit.

This Purves soil is used mainly as rangeland. Potential for range plants is medium. The climax plant community is open tall and mid grass prairie that has scattered live oak and hackberry trees. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops and pasture plants is low. Slope and shallow root zone are limitations that affect their usage.

The potential for most urban uses is low. Shallow depth to rock is a limitation that is difficult to overcome.

This Purves soil is in capability subclass IVe and in Shallow range site.

38—Purves gravelly clay, 1 to 5 percent slopes. This shallow, gently sloping soil is on uplands. Areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is very dark grayish brown gravelly clay about 7 inches thick. The next layer from 7 to 15 inches is brown clay that is very gravelly in the lower part. Below 15 inches is indurated limestone.

This soil is well drained. Permeability is moderately slow, and available water capacity is very low. The root zone is shallow over bedrock. This soil can be worked best under a narrow range of moisture content. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included with mapped areas of this soil are small areas of Bolar, Denton, and Tarrant soils. They make up less than 15 percent of this map unit.

This Purves soil is used mainly as cropland. Potential for crops such as small grains is medium. Potential for sorghum is low. Slope and shallow root zone are limitations that affect their usage. The potential for pasture plants is low. Kleingrass and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is medium. The climax plant community is an open tall and mid grass prairie with scattered live oak and hackberry trees. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is low. Shallow depth to bedrock is a problem where excavation is required for installation of structures or utilities.

This Purves soil is in capability subclass IVe and in Shallow range site.

39—Purves-Maloterre association, undulating. This map unit consists of shallow and very shallow soils on convex uplands. Areas are oval to elongated and range from 10 to several hundred acres. Slopes range from 1 to 8 percent.

About 50 percent of this unit is Purves and closely similar soils, 40 percent Maloterre and closely similar soils, and 10 percent other soils and rock outcrops. The Maloterre soils are on crests of ridges and in narrow bands on the mid slopes. The Purves soils are on the lower slopes. These soils could be separated, but because use and management are similar, it is not justified.

Typically, the surface layer of Purves soils is gravelly clay about 16 inches thick that is dark grayish brown in the upper part and very dark grayish brown in the lower part. Below 16 inches is indurated limestone. Soils closely similar to Purves include a soil that has a lighter colored surface layer, and a very shallow loamy soil.

The Purves soil is well drained. Permeability is moderately slow, and available water capacity is very low. This soil can be worked best under a narrow range of moisture content. The root zone is shallow over rock but easily penetrated by plant roots. The water erosion hazard is severe. The soil blowing hazard is slight.

Typically, the surface layer of Maloterre soil is a grayish brown gravelly clay loam about 5 inches thick. The gravel consists of limestone shells and fragments. Below 5 inches is indurated limestone containing interbedded shell fossils. Soils closely similar to Maloterre include a soil 20 to 30 inches deep to bedrock and a very gravelly soil.

The Maloterre soil is somewhat excessively drained. Permeability is moderately slow, and available water capacity is very low. The root zone is severely restricted because of very shallow depth over rock. The water erosion hazard is severe. The soil blowing hazard is slight.

Other soils and rock outcrops make up about 10 percent of the unit. The soils are small areas of Bolar and Tarrant soils.

This unit is used mainly as rangeland. It has a low potential for native range plants. The climax plant community is an open tall and mid grass prairie with live oak scattered throughout (fig. 8). Management includes controlled grazing, proper stocking, and brush control.

The potential for cropland, pasture, and urban uses is low. Stones and depth to hard rock are the main limitations.

These soils are in capability subclass VIs; Purves is in Shallow range site; Maloterre is in Very Shallow range site.

40—San Saba clay, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on valley fills and the lower slopes of uplands. Areas are mainly elongated in shape and range from 20 to 200 acres. Virgin areas have gilgai microrelief that have microdepressions and microknolls repeated each 10 to 20 feet. Microknolls are 3 to 16 inches higher than microdepressions.

Figure 8.—Excellent stand of bluestems and indiangrass that has had controlled grazing; Purves-Maloterre association, undulating.

Typically, the surface layer is dark gray calcareous clay about 4 inches thick. The next layer from 4 to 36 inches is calcareous clay that is very dark gray in the upper part and dark grayish brown in the lower part. Indurated limestone is at a depth of 36 inches.

This soil is moderately well drained. Permeability is very slow, and available water capacity is high. This soil receives excess water from higher slopes. This soil can be worked only over a narrow range of moisture content. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included with mapped areas of this soil are small areas of Crawford, Denton, Krum, and Slidell soils. They make up less than 20 percent of this map unit.

This San Saba soil is used mainly as cropland. Potential for cultivated crops is medium. Grain sorghum, cotton, and small grains are the major crops. Terraces and contour cultivation help to control erosion. Residues from crops left on the soil surface help conserve moisture, slow runoff, reduce soil temperature, maintain soil tilth, and maintain productivity. Potential is high for pasture plants. Bermudagrass, kleingrass, and King Ranch bluestem are the main grasses grown on this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is medium. The shrink-swell potential and a substratum of hard bedrock, are the main limitations, however, these can be overcome by proper design and installation. Low strength is the main limitation for local roads and streets.

This San Saba soil is in capability subclass IIIe and in Blackland range site.

41—Searsville clay, 1 to 3 percent slopes. This shallow, gently sloping soil is on convex uplands. Areas are irregular in shape and range from 10 to 150 acres.

Typically, the surface layer is reddish brown, calcareous clay about 7 inches thick. The next layer to 18 inches is calcareous clay that is red in the upper part and yellowish red in the lower part. Limestone bedrock is at a depth of 18 inches.

This soil is well drained. Permeability is slow, and available water capacity is very low. The rooting depth is restricted because of shallow depth to bedrock. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included with mapped areas of this soil are small areas of Bolar, Mosheim, and Purves soils, and Searsville gravelly clay. They make up less than 15 percent of this map unit.

This Searsville soil is used mainly for cropland. Potential for cultivated crops is medium. The shallow root zone and very low available water capacity limits the crops grown mainly to small grains. Potential for pasture

grasses is low. Kleingrass and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses and live oak trees. Management includes controlled grazing, proper stocking, and brush control.

The potential for most urban uses is low. Shallow depth to bedrock is a problem where excavation is required for installing structures or utilities.

This Searsville soil is in capability subclass IIIe and Redland range site.

42—Searsville gravelly clay, 1 to 5 percent slopes. This shallow, gently sloping soil is on convex uplands. Areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is dark brown, calcareous gravelly clay about 6 inches thick. The next layer from 6 to 18 inches is calcareous clay that is reddish brown in the upper part and yellowish red in the lower part. Limestone bedrock is at a depth of 18 inches.

This soil is well drained. Permeability is slow, and available water capacity is very low. The root zone is shallow over rock. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included with mapped areas of this soil are small areas of Bolar, Mosheim, and Purves soils, and Searsville clay. They make up less than 15 percent of this map unit.

This Searsville soil is used mainly as cropland. Potential for cultivated crops is low. Slope and shallow root zone are limitations that affect their usage. Potential for pasture plants is low. Kleingrass and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is an open tall and mid grass prairie with scattered live oak and hackberry trees. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is low. Shallow depth to bedrock is a problem where excavation is required for installing structures or utilities.

This Searsville soil is in capability subclass IVe and in Redland range site.

43—Seawillow Variant clay loam, 1 to 5 percent slopes. This deep, gently sloping soil is on stream terraces. Areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is grayish brown, calcareous clay loam about 7 inches thick. The next layer from 7 to 36 inches is yellow, calcareous clay loam. From 36 to 80 inches is weakly to strongly cemented, yellow, very gravelly loam. This soil differs from those of the Seawillow series in having very gravelly lower layers.

This soil is well drained. Permeability is moderate, and available water capacity is low. The water erosion hazard is moderate. The soil blowing hazard is slight. The root zone is deep and easily penetrated by plant roots.

Included in mapped areas of this soil are small areas of Brackett and Sunev soils. They make up less than 20 percent of this map unit.

This Seawillow soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops is medium. The high amounts of calcium carbonate in this soil inhibits the uptake of some nutrients. The gravel reduces the available water capacity. Terraces and contour cultivation help reduce erosion. Plant residues left on the soil surface also help reduce erosion, conserve moisture, and maintain soil productivity. The potential for pasture production is medium. Kleingrass and Coastal bermudagrass are the main crops grown on this soil.

Potential for most urban uses is high.

This Seawillow soil is in capability subclass IIIe and in Clay Loam range site.

44—Selden loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregular in shape and range from 10 to 50 acres.

Typically, the surface layer is brown, slightly acid loamy fine sand about 12 inches thick. From 12 to 27 inches the soil is brownish yellow, slightly acid, sandy clay loam. The layer from 27 to 60 inches is medium acid, sandy clay loam that is mottled with reds, grays, and yellows in the upper part and with light gray in the lower part.

The soil is moderately well drained. Permeability is moderately slow, and available water capacity is medium. The thick sandy surface layer is worked best under a narrow range in moisture content. The surface layer absorbs water rapidly, and a temporary water table perches on the sandy clay loam lower layer following periods of rainfall. The water erosion hazard is moderate. The soil blowing hazard is severe. The root zone is deep and easily penetrated by plant roots.

Included in mapped areas of this soil are small areas of Duffau and Windthorst soils. They make up less than 20 percent of this map unit.

This Selden soil is used mainly as cropland. Potential for cultivated crops is medium. Peanuts and truck crops are the major crops. Cover cropping and stripcropping help prevent soil blowing. Residues from plants left on the soil surface help conserve moisture and maintain soil productivity. Pecan orchards grow well on this soil. Potential for pasture plants is high. Bermudagrass and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a savannah of tall and mid grasses with scattered post oak and blackjack oak. Management includes controlled grazing, proper stocking, and brush control.

The potential for most urban uses is low. Wetness and the slow water intake rate of the lower layers are limitations that are difficult to overcome.

This Selden soil is in capability subclass IIIe and in Loamy Sand range site.

45—Slidell clay, 0 to 1 percent slopes. This deep, nearly level soil is on valley fills and low slopes of uplands. Areas are smooth and mainly elongated in shape and range from 20 to about 200 acres. Virgin areas have gilgai microrelief that have microdepressions and microknolls repeated each 10 to 20 feet. Microknolls are 3 to 16 inches higher than microdepressions.

Typically, the surface layer is very dark gray, calcareous clay about 9 inches thick. The next layer from 9 to 23 inches is very dark gray clay. From 23 to 35 inches the soil is dark gray clay. From 35 to 80 inches is clay mottled with olive, brown, and gray.

This soil is well drained. Permeability is very slow, and available water capacity is high. This soil receives runoff water from higher slopes. This soil can be worked only over a narrow range of moisture content. The water erosion hazard is slight. The soil blowing hazard is slight.

Included with mapped areas of this soil are small areas of Crawford, Denton, Krum, Purves, and San Saba soils. They make up less than 20 percent of each map unit.

This Slidell soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, cotton, and small grains are the major crops. Residues from crops left on the soil surface help conserve moisture, slow runoff, reduce soil temperature, and maintain soil tilth and productivity. Potential is high for growing pasture plants. Such grasses as bermudagrass and kleingrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is medium. The high shrink-swell potential is the main limitation, and it can be overcome by proper design and installation. Low strength is the main limitation for local roads and streets.

This Slidell soil is in capability subclass IIw and in Blackland range site.

46—Slidell clay, 1 to 3 percent slopes. This deep, gently sloping soil is on valley fills and low slopes of uplands. Areas are smooth and mainly elongated in shape and range from 10 to about 250 acres. Virgin areas have gilgai microrelief that have microdepressions and microknolls repeated each 10 to 20 feet. Microknolls are 3 to 16 inches higher than microdepressions.

Typically, this soil is a calcareous clay to about 63 inches. It is dark gray and very dark gray in the upper part and dark grayish brown that has olive brown mottles in the lower part.

This soil is well drained. Permeability is very slow, and available water capacity is high. This soil receives runoff water from higher slopes. This soil can be worked well over a narrow range of moisture content. The water erosion hazard is slight. The soil blowing hazard is slight.

Included with mapped areas of this soil are small areas of Crawford, Denton, Krum, Purves, and San Saba soils. They make up less than 20 percent of this map unit.

This Slidell soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, cotton, and small grains are the major crops. Terraces and contour cultivation help to control erosion. Residues from crops left on the soil surface help conserve moisture, slow runoff, reduce soil temperature, and maintain soil tilth and productivity. Potential is high for pasture plants. Such grasses as bermudagrass and kleingrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is medium. The high shrink-swell potential is the main limitation, and it can be overcome by proper design and installation. Low strength is the main limitation for local roads and streets.

This Slidell soil is in capability subclass IIe and in Blackland range site.

47—Sunev clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on terraces. The areas are narrow, curved bands along major streams and range from 10 to 50 acres.

Typically, the surface layer is dark grayish brown, calcareous clay loam about 8 inches thick. From 18 to 68 inches is calcareous clay loam that is grayish brown in the upper part and pale brown in the lower part that has common concretions of calcium carbonate.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is slight. The soil blowing hazard is slight.

This Sunev soil is used mainly as cropland. Potential for cultivated crops is medium. Grain sorghum, alfalfa, corn, truck crops, and small grains are the major crops. Terraces and contour cultivation help control erosion. Residues from crops left on the soil surface help conserve moisture, reduce runoff, and maintain productivity. Potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is medium. Low strength is the main limitation for local roads and streets.

This Sunev soil is in capability subclass IIe and in Clay Loam range site.

48—Sunev clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on stream terraces. It is in narrow, curved areas along streams. Areas of this soil range from 20 to 100 acres.

Typically, the surface layer is dark grayish brown, calcareous clay loam about 18 inches thick. From 18 to 60 inches is calcareous clay loam that is brown in the upper part and pale brown in the lower part. It has common concretions and soft masses of calcium carbonate.

This soil is well drained. Permeability is moderate, and available water capacity is medium. This soil can be worked over a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included in mapped areas of this soil are small areas of Bosque, Denton, Frio, Krum, and Slidell soils. They make up less than 20 percent of this map unit.

Included in mapped areas of this soil are small areas of Bosque, Denton, Frio, Krum, and Slidell soils. They make up less than 20 percent of this map unit.

This Sunev soil is used mainly as cropland. Potential for cultivated crops is high. Grain sorghum, alfalfa, corn, truck crops, and small grains are the major crops. Residues from crops left on the soil surface help conserve moisture, reduce runoff, and maintain productivity. Potential for pasture plants is high. Bermudagrass, kleingrass, and lovegrass are the commonly grown grasses on this soil.

Potential for native range plants is high. The climax plant community is an open prairie supporting an abundant growth of tall and mid grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is high. Low strength is the main limitation for local roads and streets.

This Sunev soil is in capability subclass IIs and in Clay Loam range site.

49—Tarpley clay loam, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands. Areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is dark grayish brown, moderately alkaline clay loam about 7 inches thick. The next layer is dark reddish brown, moderately alkaline clay about 8 inches thick. The underlying material below 15 inches is limestone bedrock.

This soil is well drained. Permeability is slow, and available water capacity is very low. The root zone is shallow over rock. The water erosion hazard is moderate. The soil blowing hazard is slight.

Included with mapped areas of this soil are small areas of Crawford, Denton, and Tarrant soils. They make up less than 15 percent of this map unit.

This Tarpley soil is used mainly as rangeland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses and live oak trees. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops is low. The shallow root zone and very low available water capacity limit the crops grown mainly to small grains. Potential for pasture plants is low. Kleingrass and King Ranch bluestem are the commonly grown grasses on this soil.

Potential for most urban uses is medium. However, shallow depth to hard bedrock is a problem where excavation is required for installing structures or utilities.

This Tarpley soil is in capability subclass IIIe and in Redland range site.

50—Tarrant association, undulating. This map unit consists of shallow and very shallow, well drained gently sloping to sloping soils on cobbly and stony uplands. These areas are irregular in shape and range from 10 to several hundred acres. Slopes range from 1 to 8 percent. Limestone fragments from 6 to 36 inches in diameter cover from 3 to 30 percent of the surface.

Tarrant and closely similar soils make up about 80 percent of this unit. Other soils and rock outcrops make up the remaining 20 percent. These soils could be separated, but because use and management are similar, it is not justified.

Typically, the surface layer of Tarrant soils in this unit is a very dark grayish brown, calcareous, cobbly clay about 12 inches thick. The upper 6 inches contains 25 to 30 percent by volume of limestone fragments, and the lower 6 inches contains 60 to 75 percent. Below 12 inches is fractured, indurated, platy limestone bedrock. Closely similar soils include a soil that has a lighter colored surface layer, a soil that has only a few limestone cobbles, and a soil that is 20 to 36 inches to bedrock.

The Tarrant soil is well drained. Permeability is moderately slow, and the available water capacity is very low. The root zone is restricted because of shallow and very shallow depth over rock. The water erosion hazard is severe. The soil blowing hazard is slight.

Small areas of other soils and rock outcrops are intermingled throughout the unit and make up as much 20 percent of each mapped area. The other soils are small areas of Bolar, Denton, Eckrant, and Purves.

The Tarrant soils are used mainly as rangeland. Potential for native range plants is low. The climax plant community is an open tall and mid grass prairie that has live oak scattered throughout (fig. 9). Management includes controlled grazing, proper stocking, and brush control.

Potential for cropland, pasture, and urban uses is low. Stones and depth to hard rock are limitations that are difficult to overcome.

These Tarrant soils are in capability subclass VIIs and in Low Stony Hills range site.

51—Windthorst fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Areas are irregular in shape and range from 5 to 50 acres.

Figure 9.—Tarrant association, undulating, is mainly rangeland; in background, also rangeland, is an area of Brackett-Eckrant association, hilly.

Typically, the surface layer is brown, slightly acid fine sandy loam about 10 inches thick. The next layer is reddish brown, slightly acid sandy clay about 14 inches thick. From 24 to 40 inches the soil is yellowish red, neutral sandy clay. From 40 to 48 inches the soil is reddish yellow, neutral sandy clay. From 40 to 48 inches the soil is reddish yellow, neutral sandy clay loam. The underlying material, to a depth of 60 inches, is very pale brown, calcareous sandy clay loam.

This soil is moderately well drained. The permeability is moderately slow, and the available water capacity is high. The soil tilth is poor. The surface layer is hard and crusty when dry. The soil can be satisfactorily worked only within a narrow moisture range. The root zone is deep, but some plant roots are restricted by the clayey lower layers. The water erosion hazard is moderate. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Duffau soils and a soil similar to Windthorst except that it has a prominent layer of calcium carbonate in the lower depths. The included soils make up less than 20 percent of this map unit.

This Windthorst soil is used mainly as cropland. Potential for cultivated crops is medium. Grain sorghums and truck crops are the major crops. Terraces and contour cultivation help reduce erosion. Plant residues left on the soil surface help conserve moisture, reduce runoff, and maintain soil productivity and tilth. The potential for pasture plants is high. Kleingrass, bermudagrass, and lovegrass are the commonly grown grasses on this soil.

Potential for growing native plants is high. The climax plant community is a mixture of mid and short grasses and forbs. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is medium. The moderate shrink-swell potential is a limitation that is easily overcome by proper design. The moderately slow permeability is a limitation for septic tank filter fields that can be overcome by increasing the size of the absorption area or modifying the system itself. Low strength is the main limitation for local roads and streets.

This Windthorst soil is in capability subclass IIe and in Sandy Loam range site.

52—Windthorst fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on plane to convex uplands. Areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is brown, slightly acid fine sandy loam about 9 inches thick. The next layer from 9 to 34 inches is slightly acid sandy clay that is reddish

brown in the upper part and yellowish red in the lower part. From 34 to 46 inches the soil is red, slightly acid sandy clay loam. The underlying material, to a depth of 60 inches, is very pale brown, calcareous and moderately alkaline sandy clay loam.

This soil is moderately well drained. Permeability is moderately slow, and the available water capacity is high. Soil tilth is poor, and the soil can be worked well only over a narrow range of moisture content. The root zone is deep, but some plant root penetration is restricted by the clayey lower layers. The water erosion hazard is moderate. The soil blowing hazard is moderate.

Included in mapped areas of this soil are small areas of Duffau soils and a soil similar to Windthorst except that is has an accumulation of calcium carbonate in the lower layers. The included soils make up less than 20 percent of this map unit.

This Windhorst soil is used mainly as rangeland. Potential for native range plants is high. The climax plant community is a mixture of mid and short grasses and forbs. Management includes controlled grazing, proper stocking, and brush control.

Potential for cultivated crops is medium. Grain sorghum is the major crop. Terraces and contour cultivation help control erosion. Plant residues left on the soil surface help conserve moisture, regulate soil temperature, and maintain tilth and productivity. Potential for pasture plants is high. Kleingrass, bermudagrass, and King Ranch bluestem are the common grasses grown on this soil.

Potential for most urban uses is medium. The moderate shrink-swell potential and slow water intake rate are limitations that affect urban uses. Low strength is the main limitation for local roads and streets.

This Windthorst soil is in capability subclass IIIe and in Sandy Loam range site.

53—Windthorst fine sandy loam, 1 to 5 percent slopes, eroded. This deep, gently sloping soil is on eroded uplands. Areas are irregular in shape and range from 5 to 100 acres. Sheet erosion has removed approximately 75 percent of the original surface layer. In some areas there are a few shallow gullies about 12 inches deep that are crossable with farm machinery. Erosion of the surface horizon has been erratic, resulting in plow layers that range from fine sandy loam to sandy clay loam. The plow layers of sandy clay loam are dominantly made up of the subsoil exposed by erosion and mixed by plowing.

Typically, the surface layer is yellowish brown, slightly acid fine sandy loam about 3 inches thick. The next layer from 3 to 42 inches is slightly acid sandy clay that is yellowish red in the upper part and red in the lower part. From 42 to 54 inches is very pale brown, neutral sandy clay loam. White shaly clay is at a depth of 60 inches.

This soil is moderately well drained. Permeability is moderately slow, and the available water capacity is high. The water erosion hazard is moderate. The soil blowing hazard is moderate. Soil tilth is poor. The root zone is deep but some plant root penetration is restricted by the clayey lower layers.

Included in mapped areas of this soil are small areas of Duffau soils and a soil similar to Windthorst except that it has an accumulation of calcium carbonate in the lower layer. The included soils make up less than 20 percent of this map unit.

This soil is used mainly as cropland. Potential for cultivated crops is medium. Grain sorghum, truck crops, and peanuts are the major crops. Terraces, contour cultivation, and plant residues left on the soil surface help control erosion, conserve moisture, and maintain productivity. Potential for pasture plants is high. Kleingrass, bermudagrass, and King Ranch bluestem are the common grasses grown on this soil.

Potential for rangeland production is high. The climax plant community is a mixture of mid and short grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for most urban uses is medium. The moderate shrink-swell potential and moderately slow permeability are limitations that can be overcome by proper design. Low strength is the main limitation for local roads and streets.

This Windthorst soil is in capability subclass IIIe and in Sandy Loam range site.

54—Windthorst fine sandy loam, 1 to 8 percent slopes, severely eroded. This deep, gently sloping and sloping soil is on gullied uplands. Areas are irregular in shape and range from 5 to 60 acres. V-shaped gullies occur every 30 to 50 feet. They are 3 to 5 feet in depth and 6 to 10 feet in width. Erosion of the surface layer has varied. In some places it is still fine sandy loam. In others, where erosion has removed most of the original surface layer down to the subsoil, the present plow layer is sandy clay loam.

Typically, the surface layer is yellowish brown, slightly acid fine sandy loam about 3 inches thick. The next layer from 3 to 42 inches is slightly acid sandy clay that is yellowish red in the upper part and red in the lower part. From 42 to 54 inches is very pale brown, neutral sandy clay loam. The underlying material to 60 inches is white shaly clay.

This soil is moderately well drained. Permeability is moderately slow, and the available water capacity is high. The water erosion hazard is severe. The soil blowing hazard is moderate. The root zone is deep, but the clayey lower layers restrict some plant root penetration. Losses of the surface layer has reduced productivity of this soil and has caused surface crusting and plowpan formation.

Included in mapped areas of this soil are small areas of Duffau soils. They make up less than 20 percent of this map unit.

This Windthorst soil is used as rangeland. Potential for growing native range plants is high. The climax plant

community is a mixture of mid and short grasses. Management includes controlled grazing, proper stocking, and brush control.

Potential for cropland, pasture, and urban uses is low. The gullies are a limitation that affect its usage.

This Windthorst soil is in capability subclass VIe and in Sandy Loam range site.

55—Yahola-Gaddy complex, frequently flooded. These are deep, nearly level and gently sloping soils on flood plains. Slopes range from 0 to 2 percent. The complex is in bands from 300 to 1,000 feet in width that parallel streams. Areas range from 10 to 200 acres. Flooding occurs on the average of once every 1 to 2 years.

About 70 percent of this map unit is Yahola and closely similar soils, about 25 percent Gaddy and closely similar soils, and 5 percent is other soils. Areas of these soils are so intricately mixed that mapping them separately was not practical at the scale used for mapping.

Typically, the Yahola soil surface layer, about 10 inches thick, is brown, calcareous fine sandy loam. The underlying material, extending to 63 inches, is calcareous fine sandy loam that is reddish brown in the upper part and yellowish red in the lower part. Closely similar soils include a soil that has a clay loam surface layer and a soil that is very fine sandy loam throughout.

This soil is well drained. Permeability is moderately rapid, and the available water capacity is high. The soil is flooded for very brief periods of less than 2 days duration. A water table is 10 feet below the surface in most years. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is moderate. The soil blowing hazard is moderate.

Typically, the Gaddy soil surface layer, about 10 inches thick, is brown, calcareous loamy fine sand. The underlying material, extending to 60 inches, is light brown, calcareous loamy fine sand in the upper 8 inches, and very pale brown, calcareous fine sand below. Closely similar soils to Gaddy are a soil that is noncalcareous throughout and a sandy soil that has gravelly strata.

This soil is somewhat excessively drained. Permeability is rapid. The root zone is deep and easily penetrated by plant roots. The water erosion hazard is moderate. The soil blowing hazard is severe.

Other soils in small areas are Bastrop and Paluxy which are on slightly higher adjoining stream terraces. These soils make up about 5 percent of the complex.

This unit is used mainly for rangeland. Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and trees. Management includes controlled grazing, proper stocking, and brush control.

Potential for pasture plants is high. Bermudagrass and kleingrass are the commonly grown grasses on these soils. The potential for cropland is low. Flooding is the main limitation and could be overcome only by major flood control measures.

Flooding is the main limitation for urban uses.

These Yahola and Gaddy soils are in capability subclass Vw; Yahola is in Loamy Bottomland range site; Gaddy is in Sandy Bottomland range site.

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops, pasture, and rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Soils maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 185,000 acres in the survey area was used for crops and pasture in 1970, according to the Conservation Needs Inventory (*3*). Of this total, about 15,000 acres was used for sorghums; 5,000 acres, for peanuts; 13,000 acres for cotton; 139,000 acres for wheat, oats, and barley; and about 13,000 acres was in pasture and hayland.

The soils in Bosque County have good potential for increased production of food. According to acreage data from this soil survey, there are about 250,000 acres of arable land. Of this, 175,000 acres has a clayey surface layer, 71,500 acres has a loamy surface layer, and 3,500 acres has a sandy surface layer. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the survey area. This soil survey can help facilitate the application of such technology.

Soil erosion is the major concern in Bosque County. If slope is more than 1 percent on the loamy and clayey cultivated soils, erosion is a hazard. Denton, Krum, Slidell, and Sunev soils, for example, have slopes of greater than 1 percent. The Bastrop and Selden soils have sandy surface layers and are susceptible to soil blowing.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as Duffau, Minwells, and Windthorst soils, and on soils that have a layer in or below the subsoil that limits the depth of the root zone. Such layers include bedrock, as in Purves and Searsville soils. Second, soil erosion on farmland results in sedimentation of streams. Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use for recreation and for fish and wildlife.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. Minimum tillage and crop residues on the surface help increase infiltration and reduce the hazards of erosion.

Terraces and diversions reduce the length of slope and reduce runoff and erosion. Krum, Slidell, and Bastrop soils are suitable for terraces. The other soils are less suitable for terraces and diversions because of complex slopes, sandy surface layers, or bedrock at a depth of less than 40 inches.

Contouring is a widespread erosion control practice in the survey area. It is best adapted to soils that have smooth, uniform slopes.

Soil blowing is a hazard on the sandy Bastrop and Selden soils. Soil blowing can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining a vegetative cover on the soil surface minimizes soil blowing on these soils.

Information for the design of erosion control practices for each kind of soil is contained in a technical guide, available in local offices of the Soil Conservation Service.

Soil fertility is naturally low in most sandy and loamy light-colored soils on uplands in the survey area. They are mainly acid to neutral and respond readily to commercial fertilization. The soils on flood plains such as Bosque and Frio are alkaline and naturally higher in plant nutrients than most upland soils.

On all soils additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Field crops suited to the soils and climate of the survey area include cotton, grain sorghum, oats, wheat, and rye. Large acreages can be adapted to special crops if economic conditions are favorable. Pecans are the most important tree crop grown in the county.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

In general, the soils in the survey area that are well suited to crops are also well suited to urban development. The data about specific soils in this soil survey can be used in planning future land use patterns. Potential productive capacity in farming should be weighed against soil limitations and potential for nonfarm development.

The use of the soils for pasture is an important land use in Bosque County. The major pasture grasses are bermudagrass, King Ranch bluestem, and kleingrass. Fertilizing, rotation grazing, proper stocking rate, weed and brush control, and an adequate stock water supply is required for proper pasture management. Pastureland is beneficial for uses other than grazing by livestock. Water erosion and soil blowing, the main hazards of cropland areas, are controlled adequately by a cover of pasture grasses.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil

and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland and for engineering purposes.

In the capability system (*5*), soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Rangeland

About 75 percent of Bosque County is range. It is used for the production of native vegetation that is grazed by domestic stock and wildlife.

The native vegetation in many parts of the survey area has been greatly depleted by continued excessive use. Much of the acreage that was once open grassland is now covered with brush and weeds. The amount of forage produced may be less than half of that originally produced. Productivity of the range can be increased by using management that is effective for specific kinds of soil and range sites.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for each soil in the survey area, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 8 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air dry moisture.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

In the northwestern and northeastern parts of the county most of the soils have a loamy or sandy surface layer. These soils support tall and mid grasses, and potential productivity is high because of the deep rooting depth. In the rest of the county the soils are very shallow to deep and are loamy and clayey. These soils also support tall and mid grasses with potential determined mainly by soil depth.

The major management concern on most of the rangeland is the productivity and vigor of the desirable forage plants. Managing the time of grazing, and stocking properly which permits re-establishment and growth of the plant community, are essential. Brush management and grass seeding are also needed.

When range management is based on soil survey information and range inventories, the potential is excellent for increasing the amount of forage from rangeland in the county.

Recreation

About 85 percent of the survey area has a medium to high potential for recreational development.

Meridian State Park, Lake Whitney, Clifton, Meridian, Valley Mills, the Bosque and Brazos Rivers and numerous large creeks provide many suitable areas for recreation.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Suitability to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads

and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife habitat

Wildlife in the survey area has been increasing because of better management of habitat. Special emphasis is being given to improvement of habitat for game species.

The major wildlife in the survey area are the white-tailed deer, mourning dove, bobwhite quail, turkey, raccoon, opossum, striped skunk, ringtail cat, bobcat, coyote, red and gray fox, armadillo, fox squirrel, cottontail rabbit and jackrabbit, and numerous songbirds. During the migration period, such waterfowl as mallard, pintail, teal, and canvasback ducks use water areas. Fishing resources are abundant in the water areas (fig. 10). Numerous reptiles and amphibians exist in the survey area.

The golden-cheeked warbler is on the list of endangered species and may be found in some mature stands of Ashe juniper in the survey area.

The largest area of Ashe juniper is in the Eckrant-Brackett-Cranfill general soil map unit. This acreage is in the Meridian State Park, a preserve for the golden-cheeked warbler.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing wildlife habitat. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, and clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and fea-

Figure 10.—A dam on the Bosque River provides a fishing area. The adjacent soil is Frio silty clay loam, occasionally flooded.

tures that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, and red fox.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include coyote, deer, jackrabbit, medowlark, and lark bunting.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land-use planning, for evaluating land-use alternatives, and for planning site investigations before design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil

properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil one or more properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill, sand, gravel, and topsoil. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. The ratings in table 13 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg

limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture(*4*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The *AASHTO* system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water

capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of

deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering index test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and morphology." The soil samples were tested by Texas State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Specific gravity (particle index) T 100 (AASHTO), D 653 (ASTM).

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustolls (*Ust*, meaning burnt, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Calciustolls (*Calci*, meaning with accumulations of calcium carbonate, plus *ustolls*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Calciustoll.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, carbonatic, thermic Typic Calciustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil series and morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*6*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

Bastrop series

The Bastrop series consists of deep, well drained loamy and sandy soils on stream terraces. These soils formed in thick beds of loamy alluvial sediments. Slope ranges from 0 to 5 percent.

Typical pedon of Bastrop fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 1859 and Farm Road 56 in Kopperl, 2 blocks south on Farm Road 56, 3 miles east on old railroad right-of-way, and 0.5 mile north in abandoned field:

Ap—0 to 8 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; massive; hard, friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

A12—8 to 15 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; hard, friable; common fine roots; slightly acid; gradual smooth boundary.

B21t—15 to 32 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; hard, friable; few fine roots; few fine pores; few patchy clay films on faces of peds; slightly acid; gradual smooth boundary.

B22t—32 to 70 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine subangular blocky structure; hard, friable; few fine roots; few patchy clay films on faces of peds; noncalcareous; neutral; gradual smooth boundary.

C—70 to 80 inches; reddish yellow (5YR 7/6) sandy clay loam, reddish yellow (5YR 6/6) moist; massive; slightly hard, friable; few weakly cemented concretions of calcium carbonate; few small rounded siliceous pebbles; calcareous; moderately alkaline.

Solum thickness ranges from 60 to 80 inches. Siliceous gravel makes up as much as 15 percent of the volume.

The A horizon is light brownish gray, light brown, grayish brown, dark grayish brown, yellowish brown, brown, light reddish brown, or reddish brown. The horizon is fine sandy loam or loamy fine sand. Reaction is medium acid or slightly acid.

The B2t horizon is reddish brown, red, yellowish red, reddish yellow, or light reddish brown. This horizon is sandy clay loam or clay loam. Clay content ranges from 20 to 30 percent. Reaction of the B21t horizon is slightly acid or neutral. Reaction of the B22t horizon is slightly acid through moderately alkaline.

The C horizon is light brown, reddish yellow, or light reddish brown. This horizon is sandy clay loam or loam.

Bolar series

The Bolar series consists of moderately deep, well drained loamy soils on uplands. These soils formed in calcareous loamy sediments over interbedded limestones and clayey marl. Slope ranges from 1 to 5 percent.

Typical pedon of Bolar clay loam, 1 to 3 percent slopes; from intersection of Farm Road 2602 and Farm Road 217, 1 mile southeast on Farm Road 217 to Mosheim, 0.6 mile southeast on dirt road to dead end, east 0.5 mile, and 100 feet south in cultivated field:

Ap—0 to 5 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak fine granular structure; hard, friable; common fine roots; few hard limestone fragments; calcareous; moderately alkaline; abrupt smooth boundary.

A12—5 to 15 inches, very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, friable; common fine roots; few fine weakly cemented concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B21ca—15 to 27 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; common fine strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—27 to 33 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; many fine strongly cemented concretions and fragments of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B3ca—33 to 37 inches; yellowish brown (10YR 5/6) clay loam; weak fine subangular blocky structure; interbedded with 35 percent limestone fragments up to 4 inches across; common to many soft masses of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

R—37 to 40 inches; indurated limestone bedrock.

The solum is 20 to 40 inches thick. Fragments of limestone and calcium carbonate concretions, ranging in size from gravel to stone, make up from a few to 20 percent, by volume, of the solum. The fragments are scattered throughout the pedon or as discontinuous broken remnant stone lines. Calcium carbonate equivalent of the 10- to 40-inch control section is 40 to 75 percent.

The A horizon is dark grayish brown, very dark grayish brown, brown, dark brown, or very dark brown. This horizon is clay loam or silty clay loam.

The B horizon is very pale brown, pale brown, light brown, brown, light yellowish brown, or yellowish brown. Texture is clay loam or silty clay loam. Some pedons do not have a B3ca horizon.

The R layer is indurated limestone that is fractured and interbedded with clayey marl or calcareous shale.

Bosque series

The Bosque series consists of deep, well drained loamy soils on flood plains. These soils formed in thick beds of alluvial sediments. Slope ranges from 0 to 1 percent.

Typical pedon of Bosque loam, occasionally flooded; from the intersection of Texas Highway 144 and Texas Highway 22 in Meridian, 0.25 mile west on Texas Highway 22, and 400 feet south in pasture:

A11—0 to 10 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky and granular structure; slightly hard, friable; common fine roots; few fine concretions of calcium carbonate; few round water worn pebbles; calcareous; moderately alkaline; clear smooth boundary.

A12—10 to 26 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable; few fine roots; common films and threads of

calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B21—26 to 38 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable; few fine roots; common films and threads of calcium carbonate; calcareous moderately alkaline, gradual smooth boundary.

B22—38 to 63 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak subangular blocky structure; slightly hard, friable; common films and threads of calcium carbonate; calcareous; moderately alkaline.

Texture of the 10- to 40-inch control section ranges from loam to clay loam. Clay content ranges from 20 to 35 percent.

The A horizon is brown, dark brown, dark grayish brown, or very dark grayish brown. The mollic epipedon ranges from 20 to 40 inches thick. Reaction is mildly alkaline or moderately alkaline.

The B horizon is brown, pale brown, or light yellowish brown. The B horizons are loam or clay loam.

Brackett series

The Brackett series consists of shallow, well drained loamy soils on uplands. These soils formed over soft limestone interbedded with hard limestone and chalky marl. Slope ranges from 1 to 4 percent.

Typical pedon of Brackett gravelly clay loam, in an area of Brackett-Eckrant association, hilly; from intersection of Texas Highway 6 and Farm Road 219 in Clifton, 7 miles west on Farm Road 219, 2.3 miles north on Farm Road 182, 0.2 mile east on county road, and 50 feet south in native rangeland:

A1—0 to 8 inches; light brownish gray (2.5Y 6/2) gravelly clay loam, grayish brown (2.5Y 5/2) moist; moderate fine granular structure; hard, firm; common fine roots; many wormcasts; many limestone fragments and concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

B2—8 to 15 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; few limestone fragments and few to common soft concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

Cr—15 to 60 inches; interbedded clay loams and limestone fragments with pockets of calcium carbonate.

Solum thickness ranges from 10 to 20 inches. Content of coarse fragments in the solum ranges from a few to 25 percent. Limestone fragments, 4 to 20 inches in diameter, cover from 1 to 20 percent of the soil surface. The calcium carbonate equivalent of the soil including the Cr horizon ranges from 60 to 90 percent.

The A horizon is brown, grayish brown, light brownish gray, or pale brown. This horizon is loam, gravelly loam, gravelly clay loam, or clay loam.

The B horizon is grayish brown, brown, yellowish brown, light brownish gray, pale brown, light yellowish brown, light gray, or very pale brown. This horizon is loam, gravelly clay loam, or clay loam.

The Cr horizon is very pale brown or yellowish brown. Twenty-five to fifty percent of the volume of the Cr horizon is limestone or chalk fragments. The Cr horizon is limy earths interbedded with limestone, calcareous shales, chalks, or marls, all of which have horizontal bedding.

Cranfill series

The Cranfill series consists of deep, well drained loamy soils on convex uplands. These soils formed in loamy, calcareous colluvial sediments containing many limestone fragments. Slope ranges from 3 to 8 percent.

Typical pedon of Cranfill gravelly clay loam, 3 to 5 percent slopes; from the intersection of Texas Highway 6 and Texas Highway 22 in Meridian, 6.3 miles south on Texas Highway 6, and west 600 feet in native rangeland:

A1—0 to 10 inches; grayish brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; hard, friable; common fine roots; common films, threads, and concretions of calcium carbonate; 20 percent of volume of limestone fragments from 2 millimeters to 2.5 centimeters in diameter; about 80 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

B2ca—10 to 22 inches; very pale brown (10YR 7/4) gravelly clay loam, light yellowish brown (10YR 6/4) moist; moderate medium granular and weak subangular blocky structure; hard, friable; few fine roots; many films, threads, and concretions of calcium carbonate; 26 percent by volume of limestone fragments from 2 millimeters to 4 centimeters in diameter; about 90 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

B3ca—22 to 54 inches; light yellowish brown (10YR 6/4) gravelly clay loam, yellowish brown (10YR 5/4) moist; moderate medium granular and moderate medium subangular blocky structure; hard, friable; many films, threads, and concretions of calcium carbonate; 31 percent by volume of limestone fragments from 2 millimeters to 4 centimeters in diameter; about 90 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

Cca—54 to 80 inches; very pale brown (10YR 7/4) gravelly clay loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable; many films, threads, and concretions of calcium carbonate; 20 percent by

volume of limestone fragments from 2 millimeters to 4 centimeters in diameter; about 90 percent calcium carbonate equivalent; calcareous; moderately alkaline.

Solum thickness ranges from 40 to 70 inches. The 10- to 40-inch control section ranges from 80 to 95 percent calcium carbonate equivalent. The control section ranges from 20 to 35 percent silicate clay. Fragments of limestone in the control section ranges from 15 to 35 percent.

The A horizon is grayish brown, brown, light brownish gray, or pinkish gray. In pedons where the moist value is less than 3.5, the A horizon is less than 10 inches thick. The texture is gravelly clay loam or gravelly silty clay loam. Coarse fragments, in the A horizon, range from 15 to 25 percent and are mainly limestone fragments from 2 millimeters to 4 centimeters in diameter.

The B horizon is light brownish gray, light gray, very pale brown, pale brown, pink, light yellowish brown, or yellowish brown. The texture is gravelly clay loam, gravelly silty clay loam, or gravelly loam. Coarse fragments of limestone in the B horizons ranges from 15 to 35 percent.

The C horizon ranges from gravelly clay loam to gravelly silty clay loam. Coarse fragments of limestone ranges from 15 to 25 percent.

Crawford series

The Crawford series consists of moderately deep, well drained clayey soils on uplands. These soils formed over indurated limestones and interbedded marls. Slope ranges from 1 to 3 percent.

Typical pedon of Crawford clay, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 219 in Clifton, 3.95 miles south on Texas Highway 6 to intersection with Farm Road 2602, 4.75 miles west on Farm Road 2602, 0.25 mile west on dirt road, 0.55 mile north on dirt road, and 1,000 feet east in abandoned cultivated field:

Ap—0 to 7 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) when moist; weak fine angular blocky structure; very hard, firm; common fine roots; few limestone fragments and stones on or near the surface; neutral; abrupt smooth boundary.

A12—7 to 15 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) when moist; moderate medium angular blocky structure parting to weak fine blocky; extremely hard, very firm; few fine roots; common pressure faces; few intersecting slickensides; neutral; gradual wavy boundary.

A13—15 to 26 inches; dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 3/2) when moist; moderate medium blocky structure; extremely hard, very firm; few fine roots; common pressure faces; common intersecting slickensides; neutral; abrupt wavy boundary.

R—26 to 30 inches; fractured limestone with dark reddish brown clay in cracks and crevices.

Solum thickness ranges from 20 to 36 inches over limestone bedrock. Limestone fragments and stones range from few to 15 percent of soil volume on the surface. Reaction ranges from slightly acid to moderately alkaline.

The Ap and A1 horizons are very dark brown, brown, very dark grayish brown, or dark brown. The A12 and A13 horizons are dark reddish brown, dark brown, or reddish brown. Texture ranges from silty clay to clay.

Denton series

The Denton series consists of moderately deep, well drained clayey soils on uplands. These soils formed in a mantle of calcareous clayey materials over weakly cemented to fractured indurated limestones and interbedded marls. Slope ranges from 1 to 5 percent.

Typical pedon of Denton silty clay, 1 to 3 percent slopes; from intersection of Texas Highway 6 and Texas Highway 22 in Meridian, 7.2 miles south on Texas Highway 6, west on Farm Road 2136 1.3 miles, and south 300 feet in cultivated field:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium granular and subangular blocky structure; hard, firm; many fine roots; few limestone fragments; calcareous; moderately alkaline; abrupt smooth boundary.

A12—5 to 13 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm; many fine roots; few fine pores; few limestone fragments; calcareous; moderately alkaline; gradual wavy boundary.

A13—13 to 25 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm; few pressure faces; common fine roots; few to common fine pores; few limestone fragments; few dark streaks from above; calcareous; moderately alkaline; gradual wavy boundary.

Bca—25 to 36 inches; brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; moderate medium and fine subangular blocky structure; hard, firm; few fine roots; common limestone fragments; few to common fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt irregular boundary.

Cca—36 to 40 inches; 60 to 70 percent limestone fragments (some can be cut with a spade) and 30 to 40 percent brown silty clay; massive; hard, firm; calcareous; moderately alkaline; abrupt wavy boundary.

R—40 to 58 inches; fractured limestone that cannot be cut with a spade.

Solum thickness ranges from 24 to 40 inches. Fragments of limestone smaller than 3 inches comprise from 0 to 15 percent of the soil mass.

The A horizon is dark brown, brown, dark grayish brown, or very dark grayish brown. The A horizon has textures of silty clay or clay. The mollic epipedon ranges from 18 to 35 inches thick.

Some pedons lack B horizons, but where present, the color is brown, dark brown, or pale brown. The B horizon is silty clay or silty clay loam.

The Cca horizon, where present, is a mixture of limestone fragments and silty clay that range from 60 to 80 percent fragments and 20 to 40 percent silty clay.

Duffau series

The Duffau series consists of deep, well drained loamy soils on uplands. These soils formed over sands, sandy loams, and weakly cemented sandstones. Slope ranges from 1 to 5 percent.

Typical pedon of Duffau fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 1238 and Texas Highway 6 in Iredell, 1 mile southwest on Farm Road 1238, and 100 feet west in native rangeland.

A1—0 to 5 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak very fine subangular blocky and granular structure; slightly hard, friable; many fine roots; slightly acid; clear smooth boundary.

A2—5 to 11 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—11 to 39 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate fine subangular blocky structure; hard, firm; common fine roots; patchy clay films on faces of peds; slightly acid; gradual wavy boundary.

B22t—39 to 45 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; hard, firm; few fine roots; few clay films on faces of peds; slightly acid; gradual wavy boundary.

B23t—45 to 60 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak coarse subangular blocky structure; hard, friable; few fine roots; few clay films on faces of peds; slightly acid; gradual wavy boundary.

C—60 to 68 inches; reddish yellow (7.5YR 6/6) fine sandy loam; strong brown (7.5YR 5/6) moist; few fine faint yellowish red mottles; massive, hard, friable; neutral.

Solum thickness is more than 60 inches. Content of siliceous or ironstone pebbles ranges from 0 to 5 percent, by volume, of the solum.

The A horizon is brown, pale brown, grayish brown, dark grayish brown, yellowish brown, or light yellowish brown. Reaction is slightly acid through neutral. The A horizon is fine sandy loam or loamy fine sand.

The B21t, B22t, and B23t horizons are yellowish red, reddish yellow, red, or strong brown. The B23t horizon contains none to common reddish brown, yellowish red, or strong brown mottles. The B2t horizons are sandy clay loam, loam, or clay loam that have a clay content ranging from 20 to 35 percent. Reaction is from slightly acid through mildly alkaline.

The C horizon is reddish yellow or pink. The C horizon is sandy clay loam, fine sandy loam, or weakly cemented sandstone.

Eckrant series

The Eckrant series consists of very shallow and shallow, clayey and cobbly well drained soils on uplands. These soils formed over thick beds of indurated limestone. Slope ranges from 1 to 30 percent.

Typical pedon of Eckrant cobbly clay, in an area of Eckrant association, gently undulating; from the intersection of Texas Highway 6 and Farm Road 219 in Clifton, 3.95 miles south on Texas Highway 6 to intersection with Farm Road 2602, then west on Farm Road 2602 4.75 miles, then west on dirt road 0.25 mile, then north 0.6 mile, and 50 feet east in native rangeland:

A11—0 to 4 inches; very dark grayish brown (10YR 3/2) cobbly clay, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; very hard, firm; common fine roots; estimated 20 percent by volume limestone fragments larger than 3 inches in diameter, and 20 percent by volume smaller than 3 inches in diameter; scattered limestone fragments on surface; noncalcareous; moderately alkaline; clear irregular boundary.

A12—4 to 10 inches; very dark grayish brown (10YR 3/2) cobbly clay, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; very hard, firm; few fine roots; 40 percent by volume limestone fragments larger than 3 inches in diameter and 20 percent smaller than 3 inches in diameter; matrix noncalcareous; moderately alkaline; abrupt smooth boundary.

R—10 to 12 inches, fractured indurated limestone bedrock.

Solum thickness ranges from 8 to 16 inches over limestone. Coarse fragments in the form of pebbles, cobbles, and stones comprise 35 to 70 percent by volume. The soil matrix ranges from calcareous to noncalcareous. Reaction ranges from neutral, through moderately alkaline.

The A horizon is black, very dark gray, very dark brown, very dark grayish brown, or dark brown. It is cobbly clay or very cobbly clay. Secondary calcium carbonate coats some of the limestone fragments.

Frio series

The Frio series consists of deep, well drained loamy soils on flood plains. These soils formed in thick beds of loamy alluvial sediments. Slope ranges from 0 to 1 percent.

Typical pedon of Frio silty clay loam, occasionally flooded; from the intersection of Texas Highway 6 and Farm Road 219 in Clifton, 0.9 mile east on Farm Road 219, 0.85 mile south on Farm Road 708, 7.25 miles south on dirt road, and 0.3 mile west in cultivated field:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak granular structure; hard, firm; few hard concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A12—5 to 24 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, firm; few snail shells; few films and threads of calcium carbonate in lower part; calcareous; moderately alkaline; diffuse smooth boundary.

A13—24 to 42 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; hard, firm; common films and threads of calcium carbonate; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cca—42 to 63 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; massive; hard, firm; few thin bedding planes; many films and threads and few soft masses of calcium carbonate; few streaks of darker material; calcareous; moderately alkaline.

The calcium carbonate equivalent of the 10- to 40-inch control section ranges from 15 to 30 percent. Reaction ranges from mildly alkaline to moderately alkaline.

The A horizon is grayish brown, dark grayish brown, very dark grayish brown, or dark brown. The horizon is silty clay, silty clay loam, or clay loam, containing 35 to 50 percent clay.

The Cca horizon is grayish brown or dark grayish brown. The horizon has varying amounts of stratification. Texture ranges from silty clay to clay loam.

Gaddy series

The Gaddy series consists of somewhat excessively drained sandy soils. These soils formed on bottom lands in alluvium. Slope ranges from 0 to 2 percent.

Typical pedon of Gaddy loamy fine sand from an area of Yahola-Gaddy complex, frequently flooded; from the intersection of Texas Highway 174 and Farm Road 927 in Morgan, 5.8 miles north on Texas Highway 174 to intersection with Farm Road 56, 8.8 miles north on Farm Road 56, 1.6 mile northeast of Brazospoint on paved road, and 500 feet west in native rangeland:

A1—0 to 10 inches; brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; calcareous; moderately alkaline; clear smooth boundary.

C1—10 to 18 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; single grained; soft; common thin strata of brown (7.5YR 4/4) fine sandy loam; calcareous; moderately alkaline; gradual smooth boundary.

C2—18 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grained; loose; common thin strata of brown (10YR 5/3) loamy fine sand and fine sandy loam; calcareous; moderately alkaline.

The A horizon is brown or light brown. It is loamy fine sand or fine sandy loam. The horizon is calcareous and moderately alkaline below a depth of 10 inches.

The C horizon is light brown, reddish yellow, pale brown, very pale brown, brownish yellow, or yellow. This horizon is loamy fine sand or fine sand and has a thin strata of finer or coarser material.

Hassee series

The Hassee series consists of deep, somewhat poorly drained loamy soils on uplands. These soils formed in clayey calcareous sediments. Slopes range from 0 to 2 percent.

Typical pedon of Hassee fine sandy loam, 0 to 2 percent slopes; from the intersection of Texas Highway 174 and Farm Road 927 in Morgan, 5.8 miles north on Texas Highway 174 to intersection with Farm Road 56, 9.5 miles north and west on Farm Road 56, and 500 feet north in native rangeland:

A1—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, friable; many fine roots; slightly acid; clear smooth boundary.

A2g—8 to 14 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; very hard, friable; many fine roots; slightly acid; abrupt smooth boundary.

B21tg—14 to 22 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; common fine faint reddish mottles; moderate coarse blocky structure; extremely hard, extremely firm; common fine roots; continuous clay films on faces of peds; neutral; gradual smooth boundary.

B22tg—22 to 36 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; few fine faint reddish mottles; moderate medium blocky structure; extremely hard, extremely firm; few fine roots; continuous clay films on faces of peds; few pebbles of quartz; neutral; gradual smooth boundary.

B3gca—36 to 48 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate fine blocky structure; very hard, very firm; few fine roots; continuous clay films on faces of peds; common soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cca—48 to 60 inches; light gray (10YR 7/2) clay loam, light brownish gray (10YR 6/2) moist; massive; very hard, firm; many soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 40 to 65 inches. Calcium carbonate bodies or concretions occur at depths of 30 to 50 inches.

The A horizon is loam or fine sandy loam. Reaction is slightly acid to neutral. The A1 or Ap horizon is very dark grayish brown, dark grayish brown, or grayish brown. Moist color values are 1 or 2 units of value lower. The A2g horizon is light gray, gray, light brownish gray, or grayish brown.

The B2tg horizon is dark gray, very dark gray, very dark grayish brown, or dark grayish brown. Some pedons have few to common fine reddish or yellowish mottles. Reaction is neutral through moderately alkaline. The B2tg and B3gca horizons range in clay content from about 45 to 60 percent. The B3gca horizon is brown, grayish brown, or dark grayish brown.

The Cca horizon is pale brown, light gray, light brownish gray, or grayish brown. Reaction is mildly or moderately alkaline.

Krum series

The Krum series consists of deep, well drained clayey soils on stream terraces. These soils formed in valley areas over thick beds of unconsolidated calcareous, clayey sediments. Slope ranges from 0 to 3 percent.

Typical pedon of Krum clay, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 219 in Clifton, 5.9 miles west on Farm Road 219, and 300 feet north in cultivated field:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky and moderate medium granular structure; hard, firm; common fine roots; few wormcasts; few fine concretions of calcium carbonate; few fine snail shells; calcareous; moderately alkaline; abrupt smooth boundary.

A12—5 to 22 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B2—22 to 46 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; moderate medium angular blocky structure; hard, very firm; shiny faces on peds; very dark grayish brown soil material in cracks; few fine concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Cca—46 to 63 inches; brownish yellow (10YR 6/6) silty clay loam, yellowish brown (10YR 5/6) moist; massive; hard, firm; about 10 percent by volume of concretions of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 38 to 60 inches. The soils, when dry, have cracks 0.5 inch to 1.2 inches wide that extend from the surface to depths of about 24 to 40 inches. Texture of the 10- to 40-inch control section is clay or silty clay containing 40 to 60 percent clay.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, or dark brown. Reaction ranges from mildly alkaline to moderately alkaline.

The B horizon is brown, light brown, or reddish brown. Texture is silty clay or clay. Visible concretions and powdery bodies range from less than 1 percent to about 5 percent by volume.

The C horizon is light yellowish brown, brownish yellow, light brown, reddish yellow, or light reddish brown. This horizon is silty clay, clay, or clay loam. Calcium carbonate segregations range from 2 to 15 percent by volume.

Maloterre series

The Maloterre series consists of very shallow, somewhat excessively drained loamy soils on uplands. These soils formed over thick beds of hard limestone. Slope ranges from 1 to 8 percent.

Typical pedon of Maloterre gravelly clay loam, in an area of Maloterre-Tarrant complex, 1 to 8 percent slopes; from the intersection of Texas Highway 22 and Texas Highway 6 in Meridian, 8.8 miles west on Texas Highway 22, 1.5 mile south and west on ranch road in native rangeland:

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky and granular structure; hard, firm; 15 to 25 percent fossil shells and limestone fragments; calcareous; moderately alkaline; abrupt wavy boundary.

R—5 to 7 inches; indurated limestone containing interbedded shell fossils.

Solum thickness ranges from 3 to 10 inches, and corresponds to the depth to indurated limestone. Limestone fragments in the soil range from 5 to 30 percent by volume.

The A horizon is dark grayish brown, grayish brown, or light brownish gray. A horizons with moist color values and chromas of less than 3.5 are less than 4 inches thick.

The R layer ranges from white limestone to conglomerate limestone with many interbedded fossil shells.

Minwells series

The Minwells series consists of deep, well drained loamy soils on stream terraces. These soils formed in thick beds of loamy and gravelly alluvial sediments. Slope ranges from 1 to 5 percent.

Typical pedon of Minwells fine sandy loam, 1 to 3 percent slopes; from intersection of Texas Highway 174 and Farm Road 927 in Morgan, 10.1 miles northeast on Texas Highway 174, and 0.2 mile north in native rangeland:

A1—0 to 6 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; hard, friable; many fine roots; few fine rounded siliceous pebbles; slightly acid; clear smooth boundary.

A2—6 to 14 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; weak fine subangular blocky structure; hard, friable; many fine roots; few fine rounded siliceous pebbles; slightly acid; clear smooth boundary.

B21t—14 to 22 inches; red (2.5YR 4/6) sandy clay, dark red (2.5YR 3/6) moist; moderate fine and medium blocky structure; hard, firm; few fine roots; few fine pores; clay films on faces of peds; few fine and medium rounded siliceous pebbles; slightly acid; clear wavy boundary.

B22t—22 to 36 inches; red (2.5YR 5/8) sandy clay, red (2.5YR 4/8) moist; moderate medium blocky structure; hard, firm; few fine roots; clay films on faces of peds; few fine and medium rounded siliceous pebbles; slightly acid; clear wavy boundary.

B3ca—36 to 46 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable; clay films on faces of peds; 10 to 15 percent concretions and soft bodies of calcium carbonate; about 25 percent by volume of pebbles 1/4 to 1/2 inch in diameter; calcareous; moderately alkaline; gradual smooth boundary.

Cca—46 to 80 inches; yellowish red (5YR 5/6) gravelly sandy loam, yellowish red (5YR 4/6) moist; massive; hard, friable; 8 to 10 percent concretions and soft bodies of calcium carbonate; about 45 percent by volume of pebbles 1/4 to 1/2 inch in diameter; calcareous; moderately alkaline.

Solum thickness ranges from 40 to over 60 inches to beds of gravel.

The A horizon is light reddish brown, reddish brown, light brown, or brown. Reaction is slightly acid to neutral.

The Bt horizon is reddish brown, red, yellowish red, or reddish brown. This horizon is sandy clay or clay. Reaction is slightly to moderately alkaline.

The Cca horizons are reddish yellow, yellowish red or reddish brown. Texture is gravelly sand, gravelly sandy loam, gravelly loam, very gravelly sandy clay loam, or gravelly sandy clay loam that has a content of gravel ranging from 20 to 80 percent. The Cca horizon is stratified with prominent bedding planes and the reaction is moderately alkaline and calcareous. Gravel fragments are rounded and are mostly 1/4 inch to 3 inches in diameter.

Mosheim series

The Mosheim series consists of deep, well drained clayey soils on uplands. These soils formed in calcareous clayey sediments over limestone. Slopes range from 1 to 3 percent.

Typical pedon of Mosheim silty clay, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 219 in Clifton, 3.95 miles south on Texas Highway 6 to intersection with Farm Road 2602, then west and south 9.3 miles, on Farm Road 2602 and 50 feet north in cropland field:

Ap—0 to 8 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky and moderate medium granular structure; hard, firm; common fine roots; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A12—8 to 22 inches; dark brown (7.5YR 3/2) silty clay, very dark brown (7.5YR 2/2) moist; moderate fine subangular blocky structure; hard, firm; few vertical cracks 1/2 inch wide and 10 inches long throughout the horizon; common fine roots; common fine pores; few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B21ca—22 to 30 inches; reddish brown (5YR 4/4) silty clay, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; hard, very firm; dark brown soil extends through this horizon as vertical streaks 1/4 to 1/2 inch wide; few fine pores; about 5 percent weakly and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B22ca—30 to 36 inches; reddish brown (5YR 4/4) silty clay, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; hard, firm; few dark brown vertical streaks; 8 to 10 percent by volume in concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

B23ca—36 to 48 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; moderate fine subangular blocky structure; hard, firm; few fragments of limestone and shells; 15 to 20 percent concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

R—48 to 60 inches; limestone that is fractured in the upper part but is continuous with depth; hardness of about 3 on Moh's scale.

Solum thickness is 40 to 60 inches. The dry soil has cracks 1/2 inch to 2-1/2 inches in width to depths of 20 to 32 inches. COLE is 0.07 to 0.10 in the control section. The calcium carbonate equivalent is ranges from 25 to 40 percent in the control section.

The A horizon is very dark brown, dark brown, or brown.

The B21ca and B22ca horizons are dark reddish brown, reddish brown, or yellowish red. The texture ranges from clay loam to silty clay and contains common limestone fragments and pebbles. The B23ca horizon is brown, strong brown, or reddish brown. Texture is silty clay loam, gravelly silty clay, or silty clay. The B23ca horizon contains 12 to 25 percent limestone fragments that are 3/4 inch to 2 inches across.

The R horizon is platy to massive limestone that is fractured in the upper part and massive below. The upper 2 to 3 feet is rippable.

Paluxy series

The Paluxy series consists of deep, well drained loamy soils on stream terraces. These soils formed in thick beds of loamy alluvial sediments. Slope ranges from 0 to 8 percent.

Typical pedon of Paluxy very fine sandy loam, 1 to 3 percent slopes; from intersection of Texas Highway 174 and Farm Road 927 in Morgan, 5.8 miles northeast on Texas Highway 174, 8.2 miles north on Farm Road 56, and 1.1 mile east on farm road in cultivated field:

Ap—0 to 5 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; weak granular structure; slightly hard, friable; many fine roots; medium acid; abrupt smooth boundary.

A1—5 to 16 inches; reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to weak subangular blocky; slighty hard, friable; many fine roots; slightly acid; clear smooth boundary.

B21—16 to 38 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure parting to weak subangular blocky; slightly hard, friable; few fine roots; slightly acid; gradual smooth boundary.

B22—38 to 50 inches; yellowish red (5YR 5/8) very fine sandy loam, yellowish red (5YR 4/8) moist; weak coarse prismatic structure parting to weak subangular blocky; slightly hard, friable; few fine roots; slightly acid; gradual smooth boundary.

B23—50 to 70 inches; yellowish red (5YR 5/8) very fine sandy loam, yellowish red (5YR 4/8) moist; weak subangular blocky structure; slightly hard, friable; few fine roots; neutral; gradual smooth boundary.

C—70 to 80 inches; reddish yellow (5YR 6/8) very fine sandy loam, yellowish red (5YR 5/8) moist; massive; slightly hard, friable; calcareous; moderately alkaline.

Depth to carbonates ranges from 36 to 70 inches. Texture is very fine sandy loam or loam throughout.

The A horizon is brown or reddish brown. Reaction is slightly acid to neutral.

The B horizons are reddish brown, yellowish red, or reddish yellow. Reaction is slightly acid or neutral.

The C horizon is reddish yellow, yellowish red, strong brown, light reddish brown, or pink.

Purves series

The Purves series consists of shallow, well drained clayey soils on uplands. These soils formed over interbedded limestones and marls. Slope ranges from 1 to 8 percent.

Typical pedon of Purves clay, 1 to 3 percent slopes; from the intersection of Texas Highway 6 and Farm Road 219 in Clifton, 3.95 miles south on Texas Highway 6 to intersection with Farm Road 2602, 9.2 miles west and south on Farm Road 2602, and south 0.2 mile in cultivated field:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate fine subangular blocky and granular structure; hard, friable; few fine concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A12ca—7 to 11 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate fine subangular blocky and granular structure; hard, firm; about 5 percent by volume medium concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A13ca—11 to 18 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, firm; 15 to 20 percent by volume concretions of calcium carbonate, calcareous; moderately alkaline; abrupt smooth boundary.

R—18 to 20 inches; indurated limestone.

Solum thickness ranges from 10 to 20 inches. Limestone fragments that are 1/4 inch to 10 inches across the long axis make up 0 to 35 percent by volume of the soil above the bedrock.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, or brown. Texture is clay or gravelly clay. The texture of the fine earth is clay loam, silty clay loam, or clay with clay content ranging from 35 to 55 percent.

San Saba series

The San Saba series consists of moderately deep, moderately well drained clayey soils on uplands. These soils formed in valley fill areas over indurated limestones and interbedded chalk. Slope ranges from 1 to 3 percent.

Typical pedon of San Saba clay, 1 to 3 percent slopes; in the center of a microdepression; from intersection of Texas Highway 6 and Farm Road 219 in Clifton, 3.95 miles south on Texas Highway 6, 9.6 miles south and west on Farm Road 2602 to Farm Road 217, 0.4 mile northwest on Farm Road 217, and 50 feet north in cultivated field:

Ap—0 to 4 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; moderate fine and medium granular structure; extremely hard, very firm; few fine roots; calcareous; mildly alkaline; abrupt smooth boundary.

A12—4 to 23 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; moderate fine and medium angular blocky structure; extremely hard, very firm; clay films on faces of peds; few hard concretions of calcium carbonate; calcareous; mildly alkaline; gradual wavy boundary.

AC—23 to 36 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; moderate fine angular blocky structure; extremely hard, very firm; common intersecting slickensides; soft masses and concretions of calcium carbonate; calcareous; mildly alkaline; abrupt wavy boundary.

R—36 to 38 inches; indurated limestone.

Solum thickness to limestone or limestone interbedded with clay or chalk ranges from 24 to 40 inches. When dry, these soils have cracks from 1 to 3 inches in width that extend to a depth of 20 inches or more. The soil averages between 45 to 60 percent clay. Virgin areas have gilgai microrelief. Microdepressions and microknolls repeat each 10 to 20 feet. Microknolls are 3 to 16 inches higher than microdepressions. Some pedons contain a few fragments of limestone ranging from 1/2 inch to 2 inches in diameter. Reaction ranges from mildly alkaline to moderately alkaline.

The A horizon is dark gray or very dark gray.

The AC horizon is dark gray, gray, grayish brown, or dark grayish brown.

Searsville series

The Searsville series consists of shallow, well drained clayey soils on uplands. These soils formed in calcareous clayey sediments over hard limestone. Slopes range from 1 to 5 percent.

Typical pedon of Searsville clay, 1 to 3 percent slopes; from intersection of Texas Highway 6 and Farm Road 219 in Clifton, 3.95 miles west on Farm Road 2602, 1.2 miles northwest on dirt road, and 130 feet west in old abandoned field:

Ap—0 to 7 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; hard, firm; common fine roots; few fine pores; few concretions of calcium carbonate; few fragments of limestone; calcareous; moderately alkaline; abrupt smooth boundary.

B21—7 to 14 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate medium blocky structure; very hard, very firm; few vertical streaks of reddish brown clay; common concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

B22ca—14 to 18 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; moderate fine blocky and subangular blocky structure; hard, very firm; many soft bodies of calcium carbonate, common concretions of calcium carbonate; calcareous; moderately alkaline; abrupt wavy boundary.

R—18 to 22 inches; limestone bedrock that is coarsely fractured in the upper part.

Solum thickness ranges from 10 to 20 inches. Coarse fragments, gravel and cobble sized, range from a few to 25 percent on the surface and in the soil. Coarse fragments are mostly limestone with a small amount of chert and ironstone. The dry soil has cracks 1/2 inch to 1 1/2 inches in width to depths of 10 to 18 inches. The control section ranges from 20 to 30 percent calcium carbonate equivalent.

The A horizon is dark brown, dark reddish brown, or reddish brown. A horizons with moist values and chromas of less than 3.5 are less than 7 inches thick. The texture is clay or gravelly clay.

The B21 horizon is dark reddish brown, red, or dark red. The texture, exclusive of coarse fragments, ranges from clay to silty clay with a clay content of 40 to 60 percent.

The B22ca horizon is dark reddish brown, reddish brown, yellowish red, or red. The texture, exclusive of coarse fragments, ranges from clay to silty clay with a clay content of 40 to 60 percent.

The R horizon is platy to massive limestone that is fractured in the upper part and massive in the lower part.

Seawillow Variant

The Seawillow Variant consists of moderately deep loamy soils on stream terraces. These soils formed over ancient very gravelly alluvial sediments that are high in calcium carbonate. These soils differ from the typical Seawillow series in that they contain very gravelly lower layers. Slope ranges from 1 to 5 percent.

Typical pedon of Seawillow Variant clay loam, 1 to 5 percent slopes; from intersection of Texas Highway 6 and Farm Road 219 in Clifton, 1.4 miles north on Texas Highway 6, and 0.2 mile northeast in native rangeland:

A1—0 to 7 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate fine granular structure; hard, friable; many fine roots; common wormcasts; few concretions of cal-

cium carbonate; about 10 percent by volume rounded chert and quartz gravel; calcareous; moderately alkaline; clear wavy boundary.

B2ca—7 to 36 inches; yellow (10YR 7/6) gravelly clay loam, brownish yellow (10YR 6/6) when moist; moderate fine granular structure; about 20 percent by volume chert and quartz gravel; about 15 percent, concretions and soft masses of calcium carbonate; few fine roots; calcareous; moderately alkaline; gradual smooth boundary.

Cca—36 to 80 inches; weakly to strongly cemented yellow (10YR 7/6) very gravelly loam; massive; hard, friable; few fine roots; about 50 percent chert and quartz gravel; about 10 percent soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 30 to 40 inches. Calcium carbonate equivalent is 40 to 70 percent. Reaction ranges from mildly alkaline to moderately alkaline.

The A horizon is yellowish brown, brown, or grayish brown. Chert and quartz gravel makes up 5 to 15 percent of the volume.

The B horizon is pale brown, light yellowish brown, or yellow. Chert and quartz gravel is about 15 to 25 percent.

The C horizon is very pale brown or yellow. Chert and quartz gravel is about 35 to 60 percent. Calcium carbonate concretions comprise 5 to 10 percent of the C horizon. Gravel beds occur under these soils at depths of about 30 to 40 inches.

These soils are variants of the Seawillow series in that they have very gravelly lower layers at depths of 30 to 40 inches. The minor acreage of these soils does not warrant setting up a new series.

Selden series

The Selden series consists of deep, moderately well drained sandy soils on uplands. These soils formed over sandy and loamy sediments reworked by wind. Slope ranges from 1 to 5 percent.

Typical pedon of Selden loamy fine sand, 1 to 5 percent slopes; from intersection of Texas Highway 6 and Farm Road 216 in Iredell, 0.1 mile west on Texas Highway 6, 0.5 mile south and west on paved county road, and west 100 feet in pastureland:

A1—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose, very friable; slightly acid; clear smooth boundary.

A2—6 to 12 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grained; loose; slightly acid; abrupt wavy boundary.

B21t—12 to 27 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist, many fine to medium prominent light brownish gray (10YR 6/2) and red (2.5YR 5/8) mottles; weak fine subangular blocky structure; very hard, very firm; few medium roots and pores; few clay films on faces of peds; slightly acid; gradual wavy boundary.

B22t—27 to 37 inches; coarsely mottled, light gray (10YR 7/1), yellow (10YR 7/6), and red (2.5YR 5/8) sandy clay loam; weak medium blocky structure; very hard, very firm; few fine roots and pores; few clay films on faces of peds; medium acid; gradual wavy boundary.

B23t—37 to 49 inches; light gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) moist; common medium prominent yellow (2.5Y 7/6) and red (2.5YR 5/8) mottles; weak medium blocky structure; very hard, firm; few patchy clay films on faces of peds; medium acid; gradual wavy boundary.

B3—49 to 60 inches; light gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) moist; common medium distinct yellow (2.5Y 7/6) and few fine prominent red mottles; weak blocky structure; very hard firm; medium acid.

Thickness of solum ranges from 54 to 80 inches. Thickness of the A horizon ranges from 10 to 20 inches. The A1 horizon is light brown, grayish brown, brown, or pale brown. The A2 horizon is pale brown, very pale brown, or light yellowish brown.

The upper part of the B horizon is brownish yellow mottled in shades of gray, brown, yellow, or red in some pedons. The middle and lower part of the B horizon is coarsely mottled or is light gray that has yellow and red mottles. The average clay content ranges from 18 to 35 percent. Reaction ranges from slightly acid to strongly acid.

Slidell series

The Slidell series consists of deep, well drained clayey soils on uplands. These soils formed in valley areas over thick beds of unconsolidated, calcareous, clayey sediments. Slope ranges from 0 to 3 percent.

Typical pedon of Slidell clay, 1 to 3 percent slopes; in the center of a microdepression; from intersection of Texas Highway 22 and Farm Road 219 in Cranfill Gap, 0.4 mile north on Farm Road 219, and 125 feet east in cultivated field:

Ap—0 to 5 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky and moderate medium granular structure; extremely hard, very firm; common fine roots; common wormcasts; few fine concretions of calcium carbonate; few snail fragments; calcareous; moderately alkaline; abrupt smooth boundary.

A12—5 to 10 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine subangular blocky structure; extremely hard, very firm; common fine roots; common wormcasts; shiny faces of peds;

few fine concretions of calcium carbonate; few snail fragments; calcareous; moderately alkaline; clear wavy boundary.

A13—10 to 22 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine angular blocky structure; extremely hard, very firm; few fine roots; common wormcasts; few fine concretions of calcium carbonate; shiny faces of peds; few snail fragments; calcareous; moderately alkaline; gradual wavy boundary.

A14—22 to 40 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine angular blocky structure; extremely hard, very firm; few fine concretions of calcium carbonate ranging to common in lower part; shiny faces on peds; common intersecting slickensides; calcareous; moderately alkaline; gradual wavy boundary.

AC—40 to 63 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; few medium distinct olive brown (2.5Y 4/4) mottles; moderate fine angular blocky structure; extremely hard, very firm; common fine to medium concretions of calcium carbonate; shiny faces on peds; common intersecting slickensides; calcareous; moderately alkaline.

Solum thickness of the combined A and AC horizons ranges from about 60 to more than 80 inches. When the soil is dry, the solum has cracks ranging from 0.4 inch to 2.5 inches in width at a depth of 20 inches.

Cycles of microdepressions and microknolls are repeated each 12 to 20 feet. The A horizon ranges from about 20 inches thick on a microknoll to as much as 48 inches thick in the center of a microdepression. Microknolls are 3 to 16 inches higher than the microdepressions.

The A horizon is very dark gray, dark gray, or gray.

The AC horizon is very dark grayish brown, dark grayish brown, grayish brown, light olive brown, or light yellowish brown.

Sunev series

The Sunev series consists of deep, well drained loamy soils on stream terraces. These soils formed in alluvium along major streams. Slope ranges from 0 to 3 percent.

Typical pedon of Sunev clay loam, 1 to 3 percent slopes; from the intersection of Texas Highway 22 and Texas Highway 6 in Meridian, 7.2 miles south on Texas Highway 6, 3.45 miles west on Farm Road 2136, 0.85 mile south and west on dirt road, and west 250 feet in cultivated field.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky and granular structure; hard, friable; few strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

A12—7 to 18 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B21ca—18 to 36 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, firm; about 5 percent by volume concretions of calcium carbonate; few threads and films of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—36 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak subangular blocky structure; hard, firm; 8 to 10 percent concretions and soft masses of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 40 to about 70 inches. Texture of all horizons ranges from clay loam to silty clay. Silicate clay content ranges from 24 to 35 percent. Calcium carbonate equivalent of the 10- to 40-inch control section ranges from 40 to 60 percent.

The A horizon is dark brown, dark grayish brown, brown, very dark grayish brown, or grayish brown.

The B2ca horizon is strong brown, grayish brown, brown, light brown, pale brown, or pink. The upper part of the B2ca horizon has visible carbonates that range from about 3 to 8 percent. Visible carbonates range from about 5 to 15 percent of the lower B2ca horizon.

Tarpley series

The Tarpley series consists of shallow, well drained loamy soils on uplands. These soils formed over interbedded limestones and marls. Slope ranges from 1 to 3 percent.

Typical pedon of Tarpley clay loam, 1 to 3 percent slopes; from intersection of Texas Highway 6 and Farm Road 219 in Clifton, 7 miles west on Farm Road 219, 1.55 miles north on Farm Road 182, 0.9 mile west and north on dirt road, and west 75 feet in native rangeland:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm; few fine limestone fragments; many fine roots; noncalcareous; moderately alkaline; clear smooth boundary.

B2t—7 to 15 inches; dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 2/4) moist; moderate fine subangular blocky structure; very hard, very firm; few fine pores; clay films on faces of peds; few fine calcium carbonate concretions; noncalcareous; moderately alkaline; abrupt wavy boundary.

R—15 to 18 inches; fractured limestone bedrock.

Solum thickness ranges from 13 to 20 inches. The amount of limestone fragments ranges from few to 15 percent on the surface and in the soil.

The A horizon is dark grayish brown, reddish brown, or dark reddish brown.

The B2t horizon is reddish brown or dark reddish brown.

Tarrant series

The Tarrant series consists of very shallow and shallow, well drained clayey soils on uplands. These soils formed over thick beds of fractured limestone. Slope ranges from 1 to 8 percent.

Typical pedon of Tarrant cobbly clay, in an area of Tarrant association, undulating; from the intersection of Texas Highway 6 and Texas Highway 22 in Meridian, 7 miles west on Texas Highway 22, 1.75 mile south on Farm Road 2136, and 300 feet south in native rangeland:

A11ca—0 to 6 inches; very dark grayish brown (10YR 3/2) cobbly clay, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure parting to moderate medium granular; very hard, firm; common fine roots; 25 to 30 percent by volume limestone fragments up to 10 inches across; 25 to 50 percent of soil surface littered with limestone gravel and cobbles; fragments are coated with calcium carbonate; calcareous; moderately alkaline; clear irregular boundary.

A12ca—6 to 12 inches; dark brown (10YR 4/3) cobbly clay; dark brown (10YR 3/3) moist; moderate fine blocky structure parting to moderate medium granular; very hard, firm; common fine roots; 60 to 75 percent limestone fragments, up to 10 inches across; the larger fragments have secondary carbonate deposits 1 centimeter to 3 centimeters thick on the lower side; calcareous; moderately alkaline; abrupt wavy boundary.

R—12 to 16 inches; fractured, indurated, platy limestone bedrock.

Solum thickness ranges from 8 to 16 inches. The solum contains 35 to 80 percent coarse fragments. The volumes range from 15 to 50 percent in the A11 horizon and from 60 to 80 percent in the A12 horizon. Coarse fragments greater than 3 inches in diameter comprise 25 to 65 percent of the soil. Secondary coatings of calcium carbonate are 1 centimeter to 3 centimeters thick on some fragments immediately above the R layer. Carbonates are in the form of coatings and pendants.

The A horizon is very dark grayish brown, very dark brown, or dark brown. The horizons are cobbly clay or cobbly silty clay, containing 45 to 60 percent clay.

Windthorst series

The Windthorst series consists of deep, moderately well drained loamy upland soils that formed over weakly cemented packsands and loamy materials. Slope ranges from 1 to 8 percent.

Typical pedon of Windthorst fine sandy loam, 1 to 5 percent slopes, eroded; from intersection of Farm Road 216 and Farm Road 927 in Iredell, north 0.7 mile on Farm Road 216; then northwest on paved county road 1.4 mile; then 690 feet east in pastureland:

Ap—0 to 3 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; very hard, very friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—3 to 10 inches; yellowish red (5YR 5/8) sandy clay, yellowish red (5YR 4/8) moist; coarse medium blocky structure; extremely hard, very firm; common fine roots; continuous clay films on faces of peds; slightly acid; gradual smooth boundary.

B22t—10 to 28 inches; yellowish red (5YR 5/6) sandy clay, yellowish red (5YR 4/6) moist; moderate medium blocky structure; extremely hard, very firm; few fine roots; coarse medium faint yellowish mottles; continuous clay films on faces of peds; slightly acid; gradual smooth boundary.

B3—28 to 42 inches; red (2.5YR 5/8) sandy clay, red (2.5YR 4/8) moist; weak coarse blocky structure; extremely hard, very firm; common medium distinct yellowish brown (10YR 5/6) mottles; patchy clay films on faces of peds; slightly acid; gradual smooth boundary.

C1—42 to 54 inches; very pale brown (10YR 8/3) sandy clay loam, very pale brown (10YR 7/3) moist; massive; hard, firm; fine medium prominent reddish yellow mottles; neutral; clear wavy boundary.

C2—54 to 60 inches; white (10YR 8/1) shaly clay, light gray (10YR 7/1) moist; massive; extremely hard, very firm; few fine faint brownish and yellowish mottles; thin discontinuous layers of weakly cemented sandstone; few soft bodies of calcium carbonate; calcareous; moderately alkaline.

Solum thickness ranges from 35 to 60 inches. Content of siliceous or ironstone pebbles ranges from a few to 5 percent.

A horizon is brown, reddish brown, pale brown, light brownish gray, grayish brown, yellowish brown, or dark yellowish brown. Reaction is neutral through medium acid.

The B21t horizon is red, reddish brown, or yellowish red. This horizon is clay, sandy clay, or clay loam with the clay content ranging from 35 to 50 percent. Reaction is slightly acid to medium acid.

The B22t horizon is red or yellowish red with faint through prominent red, brownish yellow, yellowish brown,

reddish yellow, strong brown, light gray, or very pale brown mottles. This horizon is clay, sandy clay, or sandy clay loam. Reaction is neutral, slightly acid, or medium acid.

The B3 horizon is prominently mottled with red, yellowish red, reddish yellow, pale brown, yellowish brown, strong brown, or yellow. This horizon is clay, sandy clay, sandy clay loam, or clay loam. Lenses or pockets of sandy loam and fragments of weakly cemented sandstone are in some pedons. Reaction is moderately alkaline through medium acid with some pedons containing films and threads of soft masses of calcium carbonate in the lower part.

The C horizon is massive clay, shaly clay, clayey shale, sandy clay, clay loam or fine sandy loam that grades to weakly cemented sandstone. Reaction is medium acid to moderately alkaline.

Yahola series

The Yahola series consists of deep, well drained loamy soils that formed over alluvium on bottom lands. Slope ranges from 0 to 5 percent.

Typical pedon of Yahola fine sandy loam in an area of Yahola-Gaddy complex, frequently flooded; from the intersection of Texas Highway 174 and Farm Road 927 in Morgan, 5.8 miles north on Texas Highway 174 to intersection with Farm Road 56, 8.8 miles north on Farm Road 56, 1.6 miles northeast of Brazospoint on paved road, and 200 feet east in native rangeland:

A1—0 to 10 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; calcareous; moderately alkaline; gradual smooth boundary.

C1—10 to 38 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable; thin strata of loamy fine sand and silt loam in the lower part; calcareous; moderately alkaline; gradual smooth boundary.

C2—38 to 63 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, very friable; thin strata of loamy fine sand, loam, and silt loam; calcareous; moderately alkaline.

The A horizon is brown, light brown, or reddish brown. This horizon is fine sandy loam or loam. Reaction is mildly alkaline or moderately alkaline in the upper 10 inches and moderately alkaline and calcareous below 10 inches.

The C horizon is strong brown, reddish yellow, reddish brown, light reddish brown, pink, or yellowish red. The horizon is fine sandy loam or loam that has clay content ranging from 5 to 18 percent above 40 inches. The horizon is fine sandy loam or loamy fine sand below 40 inches. Thin strata of coarser or finer material occur throughout the C horizon.

Formation of the soils

In this section the factors of soil formation are discussed and related to the soils in the survey area. The characteristics of the soil at any given point are determined by the physical and mineral composition of the parent material; the climate under which the parent material accumulated and has existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material. All five of these factors influence the present characteristics of every soil, but the significance of each factor varies from one place to another. In one area one factor may dominate the formation of a soil, and in another area a different factor may be more important.

The interrelationship among these five factors is complex, and the effects of any one factor cannot be isolated and completely evaluated. Each factor is discussed separately as well as the probable effects of each.

Parent material

Parent material is the unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineral composition of the soil. The soils of Bosque County have developed from parent material of two geologic periods, the Cretaceous and the Quaternary.

Cretaceous materials are mainly interbedded limestones, calcareous marls, and sands of the Trinity, Fredericksburg, and Washita groups. The limestone and marls are interbedded and are mainly from the Glen Rose, Walnut, and Comanche Peak Limestone Formations. Brackett, Maloterre, Purves, and Tarrant soils occupy the gently sloping to steep benched hills and ridges where the limestones are near the surface. Denton and Slidell soils are in shallow valley areas where the interbeds of calcareous clayey marl occur. These soils are more limy and have less distinct horizons than the sandier Windthorst and Selden soils. Duffau, Selden, and Windthorst soils formed mainly in the Paluxy Formation.

The parent material of the soils on the flood plains of the rivers and drainageways of the county consists of Quaternary deposits of alluvium. Many of these deposits on lower lying flood plains have been reworked from time to time, and new sediments have been deposited. Alkaline soils such as Bosque, Frio, and Yahola formed in deposits of the calcareous prairie areas.

Climate

Bosque County has a warm-temperate, subhumid climate and hot summers. This climate contributes to the formation of soils in several ways. Expansion that occurs at high temperatures and contraction that occurs at low temperatures fractures parent rock and hastens weathering. Patterns of rainfall distribution cause the soils to be alternately wet and dry.

A clay soil, such as Slidell clay, cracks when dry, then the cracks fill with water during rains. After it becomes wet, the clay soil swells and the cracks close. This alternate shrinking and swelling causes the soil to churn and affects the downward movement and accumulation of clay in the subsoil.

Other soils, such as Duffau and Windthorst have clayey lower layers. Water moving through the soil carries clay particles downward from the surface layer and deposits them as the water movement slows. As clay accumulates, the water moves even slower and deposition of clay accelerates. Thus, the process tends to speed up, and eventually, the lower layers become clayey.

Wind also affects the formation of soils in the county. For example, the Selden soils formed in windblown sediments.

Plant and animal life

Plants, man, animals, insects, bacteria, worms, and fungi are important in the formation of soils. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity are among the changes caused by living organisms.

Tall prairie grasses had more influence on soil development than other plants in the soils developed on limestone (see General soil map). These tall grasses provided residue that protected the surface and added organic matter to dark soils, such as Denton, Purves, and Slidell. The grass roots reached deep into the soil and fed on minerals at lower depths. Lime, minerals, and organic matter were distributed throughout the soil profile as these plants died and decomposed. The decomposed plant roots left channels that increased intake of water and the aeration of the soil. Earthworms and other soil organisms fed on the decomposed roots. The borings of earthworms also helped channel water and air through the soil.

The vegetation, dominantly oak-savanna, has affected soils formed in stratified sands, clays, and sandstones (see General soil map). The soils formed under hardwood vegetation are medium to low in organic matter and have light colored surface layers. Some of these soils are Duffau, Selden, and Windthorst.

Man has also influenced soil formation. He permitted cattle to graze vegetation on the land. He plowed the land and planted crops. These activities have their influence on soil formation.

Relief

Relief, or topography, affects soil formation through its influence on drainage, plant cover, and soil temperature. The topography of Bosque County ranges from nearly level to steep.

Nearly level to gently sloping Krum soils are deeper and have more distinct horizons than do the gently sloping and hilly Brackett soils. This difference occurs because the Krum soils in lower positions receive additional water, have less runoff, and are subject to less erosion than the Brackett soils.

On the steeper slopes, geological erosion occurs almost as fast as the soil material is formed. For example, Tarrant soils have been forming as long as the less sloping Bolar soils, but they are much shallower in their development.

Time

Generally a long time is required for formation of soils that have distinct horizons. The length of time that parent materials have been in place, therefore, is commonly reflected in the development of the soil profile.

The soils in Bosque County range from young to old. The young soils have little horizon development, and the older soils have well expressed soil horizons.

Bosque soils are an example of young soils that have little development. The soil horizons of Bosque soils still show the evidence of stratification, and there has been little change from the original stream deposited alluvium. Selden soils are an example of older soils that have well developed soil horizons. The parent materials of Selden soils have been in place for a long time. There has been a downward movement and accumulation of clay particles, an accumulation of a thin darkened upper surface layer, and the development of a thick leached lower surface layer.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. (*In*) 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Texas Conservation Needs Committee. 1970. Conservation needs inventory U.S. Department of Agriculture, Soil Conservation Service 297. pp. illus.

(4) United States Department of Agriculture. 1951. Soil survey manual. U.S. Department Agriculture Handbook 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962.]

(5) United States Department of Agriculture. 1961. Land capability classification. U.S. Department Agriculture Handbook 210, 21 pp.

(6) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conservation Service, U.S. Department Agriculture Handbook 436, 754, pp., illus.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Medium	6 to 9
High	9 to 12
Very high	More than 12

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock. Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle

to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For

example, slope, differences in slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded 1951-76, Whitney Dam, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	57.2	32.6	44.9	83	12	57	1.82	.33	2.96	4	.6
February---	61.1	36.4	48.7	85	17	90	2.19	.94	3.20	4	.2
March------	68.5	43.6	56.1	90	24	247	1.76	.50	2.77	4	.0
April------	77.2	54.1	65.7	93	33	471	4.12	1.79	6.01	6	.0
May--------	83.7	61.5	72.6	97	44	701	4.59	2.43	6.35	6	.0
June-------	91.7	68.8	80.3	101	56	909	3.26	.79	5.20	4	.0
July-------	96.2	71.9	84.1	106	63	1,057	2.06	.27	3.40	3	.0
August-----	96.8	71.2	84.1	106	60	1,057	1.75	.21	2.89	3	.0
September--	89.2	65.6	77.5	103	49	825	3.35	1.57	4.80	4	.0
October----	79.7	54.5	67.1	94	36	530	3.62	.85	5.83	4	.0
November---	67.2	42.9	55.1	87	23	198	2.40	.49	3.88	4	.0
December---	59.8	35.1	47.5	82	16	68	2.03	.67	3.11	4	.0
Yearly:											
Average--	77.4	53.2	65.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	107	11	---	---	---	---	---	---
Total----	---	---	---	---	---	6,210	32.95	26.01	39.50	50	.8

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded 1951-76, Whitney Dam, Texas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 4	March 19	April 1
2 years in 10 later than--	February 25	March 13	March 27
5 years in 10 later than--	February 11	March 2	March 16
First freezing temperature in fall:			
1 year in 10 earlier than--	November 19	November 4	October 30
2 years in 10 earlier than--	November 28	November 13	November 5
5 years in 10 earlier than--	December 15	November 30	November 17

TABLE 3.--GROWING SEASON

[Data were recorded 1951-76, Whitney Dam, Texas]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	276	243	219
8 years in 10	287	253	228
5 years in 10	306	272	245
2 years in 10	326	292	262
1 year in 10	336	302	271

TABLE 4.--POTENTIAL OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Percent of area*	Cultivated crops	Pasture	Rangeland	Urban uses
1. Eckrant-Brackett-Cranfill	39	Low: slope, depth to rock.	Low: slope, depth to rock.	Low: slope, depth to rock.	Low: slope, depth to rock.
2. Denton-Purves	22	Medium: depth to rock.	Medium: depth to rock.	High	Medium: depth to rock.
3. Tarrant-Denton	8	Low: small stones, depth to rock.	Low: small stones, depth to rock.	Medium: depth to rock.	Low: small stones. depth to rock.
4. Purves-Maloterre	8	Low: small stones, depth to rock.	Low: small stones, depth to rock.	Medium: depth to rock.	Low: small stones, depth to rock.
5. Mosheim-Searsville	3	High	Medium: too clayey.	High	Medium: shrink-swell.
6. Krum-Sunev	12	High	High	High	Medium: shrink-swell, low strength.
7. Bastrop-Minwells-Yahola	3	High	High	High	High
8. Frio-Bosque	3	High	High	High	Low: floods.
9. Windthorst-Duffau	2	Medium: erodes easily, slope.	High	High	Medium: shrink-swell.

* One percent of the soil in the county is in water areas.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Bastrop loamy fine sand, 1 to 5 percent slopes	1,560	0.2
2	Bastrop fine sandy loam, 0 to 1 percent slopes	1,530	0.2
3	Bastrop fine sandy loam, 1 to 3 percent slopes	3,380	0.5
4	Bastrop fine sandy loam, 3 to 5 percent slopes	550	0.1
5	Bastrop fine sandy loam, 1 to 5 percent slopes, eroded	1,580	0.2
6	Bolar clay loam, 1 to 3 percent slopes	2,030	0.3
7	Bolar clay loam, 3 to 5 percent slopes	1,250	0.2
8	Bosque loam, occasionally flooded	4,410	0.7
9	Brackett gravelly clay loam, 1 to 5 percent slopes	1,150	0.2
10	Brackett-Eckrant association, hilly	73,680	11.5
11	Cranfill gravelly clay loam, 3 to 5 percent slopes	45,110	7.0
12	Cranfill gravelly clay loam, 3 to 5 percent slopes, eroded	15,190	2.4
13	Cranfill gravelly clay loam, 5 to 8 percent slopes	5,840	0.9
14	Cranfill gravelly clay loam, 5 to 8 percent slopes, eroded	1,540	0.2
15	Cranfill gravelly clay loam, 3 to 8 percent slopes, severely eroded	920	0.1
16	Crawford clay, 1 to 3 percent slopes	5,210	0.8
17	Denton silty clay, 1 to 3 percent slopes	29,300	4.6
18	Denton silty clay, 3 to 5 percent slopes	18,460	2.9
19	Duffau fine sandy loam, 1 to 3 percent slopes	1,050	0.2
20	Duffau fine sandy loam, 3 to 5 percent slopes	470	0.1
21	Duffau fine sandy loam, 1 to 5 percent slopes, eroded	580	0.1
22	Eckrant association, gently undulating	79,000	12.3
23	Frio silty clay loam, occasionally flooded	27,250	4.2
24	Hassee fine sandy loam, 0 to 2 percent slopes	2,260	0.4
25	Krum clay, 0 to 1 percent slopes	4,140	0.6
26	Krum clay, 1 to 3 percent slopes	22,000	3.4
27	Maloterre-Tarrant complex, 1 to 8 percent slopes	40,040	6.2
28	Minwells fine sandy loam, 1 to 3 percent slopes	4,120	0.6
29	Minwells fine sandy loam, 3 to 5 percent slopes	1,100	0.2
30	Minwells fine sandy loam, 1 to 5 percent slopes, eroded	2,160	0.3
31	Mosheim silty clay, 1 to 3 percent slopes	4,140	0.6
32	Paluxy very fine sandy loam, 0 to 1 percent slopes	530	0.1
33	Paluxy very fine sandy loam, 1 to 3 percent slopes	1,390	0.2
34	Paluxy very fine sandy loam, 5 to 8 percent slopes	510	0.1
35	Pits	420	0.1
36	Purves clay, 1 to 3 percent slopes	20,680	3.2
37	Purves clay, 3 to 5 percent slopes	14,710	2.3
38	Purves gravelly clay, 1 to 5 percent slopes	17,950	2.8
39	Purves-Maloterre association, undulating	63,690	10.0
40	San Saba clay, 1 to 3 percent slopes	2,180	0.3
41	Searsville clay, 1 to 3 percent slopes	3,490	0.6
42	Searsville gravelly clay, 1 to 5 percent slopes	2,230	0.4
43	Seawillow Variant clay loam, 1 to 5 percent slopes	1,700	0.3
44	Selden loamy fine sand, 1 to 5 percent slopes	1,700	0.3
45	Slidell clay, 0 to 1 percent slopes	1,430	0.2
46	Slidell clay, 1 to 3 percent slopes	41,660	6.5
47	Sunev clay loam, 0 to 1 percent slopes	578	0.1
48	Sunev clay loam, 1 to 3 percent slopes	17,150	2.7
49	Tarpley clay loam, 1 to 3 percent slopes	4,470	0.7
50	Tarrant association, undulating	20,550	3.2
51	Windthorst fine sandy loam, 1 to 3 percent slopes	2,760	0.4
52	Windthorst fine sandy loam, 3 to 5 percent slopes	1,920	0.3
53	Windthorst fine sandy loam, 1 to 5 percent slopes, eroded	6,500	1.0
54	Windthorst fine sandy loam, 1 to 8 percent slopes, severely eroded	3,000	0.5
55	Yahola-Gaddy complex, frequently flooded	1,210	0.2
	Water	8,512	1.3
	Total	641,920	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Grain sorghum	Wheat	Oats	Improved bermudagrass	Cotton lint
	Bu	Bu	Bu	AUM*	Lb
1---------- Bastrop	55	---	---	6.0	350
2---------- Bastrop	70	---	---	7.0	400
3---------- Bastrop	55	---	---	7.0	350
4---------- Bastrop	45	---	---	5.5	300
5---------- Bastrop	40	---	---	5.0	250
6---------- Bolar	40	---	40	5.0	---
7---------- Bolar	35	---	35	5.0	---
8---------- Bosque	65	---	60	6.5	450
9---------- Brackett	---	10	20	2.0	---
10:**					
Brackett----------	---	---	---	---	---
Eckrant----------	---	---	---	---	---
11---------- Cranfill	35	30	40	5.0	---
12---------- Cranfill	30	25	35	4.5	---
13---------- Cranfill	30	25	35	4.5	---
14---------- Cranfill	---	---	---	4.0	---
15---------- Cranfill	---	---	---	4.0	---
16---------- Crawford	75	30	60	6.0	350
17---------- Denton	65	35	60	6.0	350
18---------- Denton	55	30	50	5.0	300
19---------- Duffau	45	---	40	6.5	---
20, 21---------- Duffau	40	---	35	6.0	---

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Grain sorghum	Wheat	Oats	Improved bermudagrass	Cotton lint
	Bu	Bu	Bu	AUM*	Lb
22**-- Eckrant	---	---	---	---	---
23-- Frio	75	---	60	7.0	450
24-- Hassee	35	---	30	4.5	---
25-- Krum	75	---	70	8.0	450
26-- Krum	70	---	70	8.0	400
27** Maloterre-Tarrant	---	---	---	---	---
28-- Minwells	45	---	40	5.5	---
29-- Minwells	35	---	35	4.5	---
30-- Minwells	30	---	30	4.0	---
31-- Mosheim	65	35	60	6.5	350
32-- Paluxy	60	---	---	7.0	350
33-- Paluxy	50	---	---	6.5	300
34-- Paluxy	35	---	---	5.5	---
35.** Pits					
36-- Purves	35	20	45	4.0	---
37-- Purves	25	20	40	3.5	---
38-- Purves	---	15	30	3.0	---
39:**					
Purves--	---	15	30	3.0	---
Maloterre--	---	---	---	---	---
40-- San Saba	75	30	55	6.0	350
41-- Searsville	35	20	45	4.0	250
42-- Searsville	20	15	35	3.0	150
43-- Seawillow Variant	40	30	40	6.0	200

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Grain sorghum	Wheat	Oats	Improved bermudagrass	Cotton lint
	Bu	Bu	Bu	AUM*	Lb
44---------- Selden	40	---	---	5.5	---
45---------- Slidell	80	30	---	7.0	400
46---------- Slidell	70	30	---	7.0	350
47---------- Sunev	70	---	60	6.5	300
48---------- Sunev	55	---	55	6.5	250
49---------- Tarpley	25	---	30	2.5	---
50**---------- Tarrant	---	---	---	---	---
51---------- Windthorst	45	---	40	6.0	---
52---------- Windthorst	35	---	35	5.0	---
53---------- Windthorst	35	---	30	4.5	---
54---------- Windthorst	---	---	---	3.0	---
55**---------- Yahola-Gaddy	---	---	---	6.3	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	2,060	---	---	---	---
II	166,788	128,980	33,090	4,718	---
III	138,120	138,120	---	---	---
IV	78,059	78,059	---	---	---
V	1,210	---	1,210	---	---
VI	5,460	5,460	---	---	---
VII	241,291	---	---	241,291	---
VIII	---	---	---	---	---

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
1---------- Bastrop	Loamy Sand----------	Favorable	5,000	Little bluestem----------	30
		Normal	4,200	Sand lovegrass----------	10
		Unfavorable	3,500	Big bluestem----------	5
				Indiangrass----------	10
				Texas bluegrass----------	5
				Purpletop----------	5
				Silver bluestem----------	5
				Tall dropseed----------	5
				Post oak----------	5
				Blackjack oak----------	5
				Shrubs----------	5
				Perennial forbs----------	5
2, 3, 4, 5--------- Bastrop	Sandy Loam----------	Favorable	5,500	Little bluestem----------	30
		Normal	4,500	Big bluestem----------	10
		Unfavorable	3,000	Indiangrass----------	10
				Sideoats grama----------	10
				Cane bluestem----------	5
				Texas wintergrass----------	5
				Post oak----------	5
				Shrubs----------	5
				Perennial forbs----------	10
6, 7---------- Bolar	Clay Loam----------	Above average	6,500	Little bluestem----------	20
		Normal	5,500	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	10
				Sideoats grama----------	10
				Silver bluestem----------	5
				Tall dropseed----------	5
				Canada wildrye----------	5
				Englemanndaisy----------	5
				Perennial forbs----------	10
8---------- Bosque	Loamy Bottomland----------	Favorable	8,000	Indiangrass----------	20
		Normal	6,000	Little bluestem----------	15
		Unfavorable	4,000	Switchgrass----------	15
				Big bluestem----------	10
				Sideoats grama----------	5
				Canada wildrye----------	5
				Vine-mesquite----------	5
				Texas needlegrass----------	5
				Tall dropseed----------	5
9---------- Brackett	Adobe----------	Favorable	4,000	Little bluestem----------	40
		Normal	3,200	Sideoats grama----------	8
		Unfavorable	1,800	Tall grama----------	7
				Indiangrass----------	5
				Silver bluestem----------	5
10:*					
Brackett----------	Steep Adobe----------	Favorable	3,000	Little bluestem----------	30
		Normal	2,200	Sideoats grama----------	10
		Unfavorable	1,500	Tall grama----------	10
				Indiangrass----------	10
				Tall dropseed----------	5
				Silver bluestem----------	5
				Slim tridens----------	5
				Hairy grama----------	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
10:*					
Eckrant	Steep Rocky	Favorable	1,800	Texas needlegrass	25
		Normal	1,400	Sideoats grama	20
		Unfavorable	800	Little bluestem	10
				Pinhole bluestem	10
				Indiangrass	5
				Green sprangletop	5
				Ashe juniper	5
11, 12, 13, 14, 15-Cranfill	Clay Loam	Above average	6,500	Little bluestem	20
		Normal	5,500	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Sideoats grama	10
				Silver bluestem	5
				Tall dropseed	5
				Canada wildrye	5
				Englemanndaisy	5
				Perennial forbs	10
16-Crawford	Deep Redland	Favorable	6,000	Little bluestem	40
		Normal	5,000	Big bluestem	10
		Unfavorable	3,500	Indiangrass	5
				Sideoats grama	5
				Tall dropseed	5
				Silver bluestem	5
				Texas needlegrass	5
				Buffalograss	5
17, 18-Denton	Clay Loam	Above average	6,500	Little bluestem	20
		Normal	5,500	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Sideoats grama	10
				Silver bluestem	5
				Tall dropseed	5
				Canada wildrye	5
				Englemanndaisy	5
				Perennial forbs	10
19, 20, 21-Duffau	Sandy Loam	Favorable	5,500	Little bluestem	30
		Normal	4,500	Big bluestem	10
		Unfavorable	3,000	Indiangrass	10
				Sideoats grama	10
				Cane bluestem	5
				Texas wintergrass	5
				Post oak	5
				Shrubs	5
				Perennial forbs	10
22:*-Eckrant	Low Stony Hills	Favorable	3,000	Little bluestem	20
		Normal	2,500	Sideoats grama	20
		Unfavorable	1,500	Indiangrass	10
				Pinhole bluestem	5
				Green sprangletop	5
				Fall witchgrass	5
				Meadow dropseed	5
23-Frio	Loamy Bottomland	Favorable	8,000	Big bluestem	10
		Normal	6,000	Little bluestem	10
		Unfavorable	4,000	Vine-mesquite	10
				Switchgrass	5
				Indiangrass	5
				Eastern gamagrass	5
				Texas needlegrass	5
				Plains lovegrass	5
				Canada wildrye	5
				Cane bluestem	5
				Southwestern bristlegrass	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map unit and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
24---------- Hassee	Claypan Prairie----------	Favorable Normal Unfavorable	4,000 3,000 2,000	Vine-mesquite---------- Sideoats grama---------- Arizona cottontop---------- Buffalograss---------- Blue grama---------- Texas needlegrass---------- Tall dropseed---------- Sand dropseed---------- Purple threeawn---------- Silver bluestem----------	20 10 10 5 5 5 5 5 5 5
25, 26---------- Krum	Clay Loam----------	Above average Normal Unfavorable	6,500 5,500 3,000	Little bluestem---------- Indiangrass---------- Big bluestem---------- Sideoats grama---------- Silver bluestem---------- Tall dropseed---------- Canada wildrye---------- Englemanndaisy---------- Perennial forbs----------	20 15 10 10 5 5 5 5 10
27:* Maloterre---------	Very Shallow----------	Favorable Normal Unfavorable	1,500 1,200 750	Little bluestem---------- Sideoats grama---------- Indiangrass---------- Rough tridens---------- Tall grama---------- Tall dropseed----------	20 15 10 10 10 10
Tarrant-----------	Low Stony Hills----------	Favorable Normal Unfavorable	2,500 1,800 1,200	Little bluestem---------- Sideoats grama---------- Curlymesquite---------- Buffalograss---------- Green sprangletop---------- Texas needlegrass---------- Texas cupgrass---------- Tall dropseed---------- Silver bluestem---------- Live oak---------- Ashe juniper----------	15 15 10 5 5 5 5 5 5 5 5
28, 29, 30--------- Minwells	Sandy Loam----------	Favorable Normal Unfavorable	5,500 4,500 3,000	Little bluestem---------- Big bluestem---------- Indiangrass---------- Sideoats grama---------- Cane bluestem---------- Texas wintergrass---------- Post oak---------- Shrubs---------- Perennial forbs----------	30 10 10 10 5 5 5 5 10
31---------- Mosheim	Clay Loam----------	Above average Normal Unfavorable	6,500 5,500 3,000	Little bluestem---------- Indiangrass---------- Big bluestem---------- Sideoats grama---------- Silver bluestem---------- Tall dropseed---------- Canada wildrye---------- Englemanndaisy---------- Perennial forbs----------	20 15 10 10 5 5 5 5 10
32, 33, 34--------- Paluxy	Sandy Loam----------	Favorable Normal Unfavorable	5,500 4,500 3,000	Little bluestem---------- Big bluestem---------- Indiangrass---------- Sideoats grama---------- Cane bluestem---------- Texas wintergrass---------- Post oak---------- Shrubs---------- Perennial forbs----------	30 10 10 10 5 5 5 5 10

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
36, 37, 38---------- Purves	Shallow----------	Favorable	3,000	Little bluestem----------	30
		Normal	2,500	Indiangrass----------	15
		Unfavorable	1,800	Big bluestem----------	10
				Sideoats grama----------	10
				Switchgrass----------	5
				Hairy grama----------	5
				Texas needlegrass----------	5
				Silver bluestem----------	5
39:*					
Purves----------	Shallow----------	Favorable	3,000	Little bluestem----------	30
		Normal	2,500	Indiangrass----------	15
		Unfavorable	1,800	Big bluestem----------	10
				Sideoats grama----------	10
				Switchgrass----------	5
				Hairy grama----------	5
				Texas needlegrass----------	5
				Silver bluestem----------	5
Maloterre----------	Very Shallow----------	Favorable	1,500	Little bluestem----------	20
		Normal	1,200	Sideoats grama----------	15
		Unfavorable	750	Indiangrass----------	10
				Rough tridens----------	10
				Tall grama----------	10
				Tall dropseed----------	10
40---------- San Saba	Blackland----------	Favorable	6,000	Little bluestem----------	45
		Normal	5,000	Big bluestem----------	10
		Unfavorable	3,500	Indiangrass----------	10
				Switchgrass----------	5
				Texas needlegrass----------	5
				Sideoats grama----------	5
				Silver bluestem----------	5
41, 42---------- Searsville	Redland----------	Favorable	5,500	Little bluestem----------	30
		Normal	4,500	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	10
				Sideoats grama----------	10
				Switchgrass----------	5
				Silver bluestem----------	5
				Texas needlegrass----------	5
				Meadow dropseed----------	5
				Live oak----------	5
43---------- Seawillow Variant	Clay Loam----------	Favorable	6,500	Little bluestem----------	20
		Normal	5,500	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	0
				Sideoats grama----------	10
				Silver bluestem----------	5
				Tall dropseed----------	5
				Canada wildrye----------	5
				Englemanndaisy----------	5
				Perennial forbs----------	10
44---------- Selden	Loamy Sand----------	Favorable	5,000	Little bluestem----------	30
		Normal	4,200	Sand lovegrass----------	10
		Unfavorable	3,500	Big bluestem----------	5
				Indiangrass----------	5
				Texas bluegrass----------	5
				Purpletop----------	5
				Silver bluestem----------	5
				Tall dropseed----------	5
				Post oak----------	5
				Blackjack oak----------	5
				Shrubs----------	5
				Perennial forbs----------	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
45, 46---------- Slidell	Blackland----------	Favorable	6,000	Little bluestem----------	45
		Normal	5,000	Big bluestem----------	10
		Unfavorable	3,000	Sideoats grama----------	5
				Texas needlegrass----------	5
				Meadow dropseed----------	5
				Buffalograss----------	5
				Silver bluestem----------	5
47, 48---------- Sunev	Clay Loam----------	Above average	6,500	Little bluestem----------	20
		Normal	5,500	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	10
				Sideoats grama----------	10
				Silver bluestem----------	5
				Tall dropseed----------	5
				Canada wildrye----------	5
				Englemanndaisy----------	5
				Perennial forbs----------	10
49---------- Tarpley	Redland----------	Favorable	5,500	Little bluestem----------	25
		Normal	4,500	Indiangrass----------	15
		Unfavorable	3,500	Big bluestem----------	10
				Texas needlegrass----------	10
				Sideoats grama----------	5
				Tall dropseed----------	5
				Silver bluestem----------	5
				White shin oak----------	5
				Live oak----------	5
				Post oak----------	5
50:*---------- Tarrant	Low Stony Hills----------	Favorable	2,500	Little bluestem----------	15
		Normal	1,800	Sideoats grama----------	15
		Unfavorable	1,200	Curlymesquite----------	10
				Buffalograss----------	5
				Green sprangletop----------	5
				Texas needlegrass----------	5
				Texas cupgrass----------	5
				Tall dropseed----------	5
				Silver bluestem----------	5
				Live oak----------	5
51, 52, 53, 54----- Windthorst	Sandy Loam----------	Favorable	5,500	Little bluestem----------	30
		Normal	4,500	Big bluestem----------	10
		Unfavorable	3,000	Indiangrass----------	10
				Sideoats grama----------	10
				Cane bluestem----------	5
				Texas wintergrass----------	5
				Post oak----------	5
				Shrubs----------	5
				Perennial forbs----------	10
55:*					
Yahola----------	Loamy Bottomland----------	Favorable	8,000	Big bluestem----------	25
		Normal	6,000	Indiangrass----------	15
		Unfavorable	4,000	Switchgrass----------	15
				Little bluestem----------	10
				Eastern gamagrass----------	5
				Tall dropseed----------	5
				Beaked panicum----------	5
				Compassplant----------	5
				Sedge----------	5
				Heath aster----------	5
Gaddy----------	Sandy Bottomland----------	Favorable	3,800	Switchgrass----------	30
		Normal	2,700	Sand bluestem----------	15
		Unfavorable	2,000	Indiangrass----------	15
				Little bluestem----------	5
				Texas bluegrass----------	5
				Beaked panicum----------	5
				Purpletop----------	5
				Goldenrod----------	5
				Heath aster----------	5
				Maximilian sunflower----------	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
1--Bastrop	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.
2--Bastrop	Slight	Slight	Slight	Slight.
3, 4, 5--Bastrop	Slight	Slight	Moderate: slope.	Slight.
6, 7--Bolar	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
8--Bosque	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
9--Brackett	Moderate: percs slowly.	Slight	Severe: depth to rock.	Slight.
10:*				
Brackett	Severe: slope.	Severe: slope.	Severe: depth to rock.	Moderate: slope.
Eckrant	Severe: large stones, too clayey, slope.	Severe: large stones, too clayey, slope.	Severe: depth to rock, slope, large stones.	Severe: large stones, too clayey.
11, 12--Cranfill	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.
13, 14--Cranfill	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
15--Cranfill	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.
16--Crawford	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
17, 18--Denton	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
19--Duffau	Slight	Slight	Moderate: slope.	Slight.
20, 21--Duffau	Slight	Slight	Moderate: slope.	Slight.
22*--Eckrant	Severe: large stones, too clayey.	Severe: large stones, too clayey.	Severe: depth to rock, large stones, too clayey.	Severe: large stones, too clayey.
23--Frio	Severe: floods.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
24--Hassee	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness, percs slowly.	Moderate: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
25, 26---------- Krum	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
27:* Maloterre----------	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: depth to rock.	Moderate: too clayey.
Tarrant----------	Severe: large stones, too clayey.	Severe: large stones, too clayey.	Severe: depth to rock, large stones.	Severe: large stones, too clayey.
28, 29, 30---------- Minwells	Slight----------	Slight----------	Moderate: slope.	Slight.
31---------- Mosheim	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
32---------- Paluxy	Slight----------	Slight----------	Slight----------	Slight.
33---------- Paluxy	Slight----------	Slight----------	Moderate: slope.	Slight.
34---------- Paluxy	Slight----------	Slight----------	Severe: slope.	Slight.
35.* Pits				
36, 37---------- Purves	Severe: too clayey.	Severe: too clayey.	Severe: depth to rock, too clayey.	Severe: too clayey.
38---------- Purves	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
39:* Purves----------	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Maloterre----------	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: depth to rock.	Moderate: too clayey.
40---------- San Saba	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
41---------- Searsville	Severe: too clayey.	Severe: too clayey.	Severe: too clayey, depth to rock.	Severe: too clayey.
42---------- Searsville	Severe: too clayey.	Severe: too clayey.	Severe: too clayey, depth to rock, small stones.	Severe: too clayey.
43---------- Seawillow Variant	Slight----------	Slight----------	Moderate: too clayey, slope.	Slight.
44---------- Selden	Moderate: too sandy, percs slowly.	Moderate: too sandy.	Severe: too sandy, soil blowing.	Moderate: too sandy.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map unit and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
45, 46---------- Slidell	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly, too clayey.	Severe: too clayey.
47---------- Sunev	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
48---------- Sunev	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.
49---------- Tarpley	Severe: too clayey.	Severe: too clayey.	Severe: depth to rock.	Severe: too clayey.
50*---------- Tarrant	Severe: large stones, too clayey.	Severe: large stones, too clayey.	Severe: depth to rock, large stones.	Severe: large stones, too clayey.
51---------- Windthorst	Moderate: percs slowly.	Slight----------	Moderate: percs slowly.	Slight.
52, 53, 54---------- Windthorst	Moderate: percs slowly.	Slight----------	Moderate: percs slowly.	Slight.
55:*				
Yahola----------	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Gaddy----------	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements--						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
1---------- Bastrop	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
2, 3---------- Bastrop	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
4---------- Bastrop	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
5---------- Bastrop	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
6---------- Bolar	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
7---------- Bolar	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
8.---------- Bosque	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
9---------- Brackett	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
10:* Brackett----------	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Very poor	Very poor	Fair.
Eckrant----------	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
11---------- Cranfill	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
12---------- Cranfill	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
13---------- Cranfill	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
14---------- Cranfill	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
15---------- Cranfill	Poor	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
16---------- Crawford	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
17---------- Denton	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
18---------- Denton	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
19---------- Duffau	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
20, 21---------- Duffau	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
22*---------- Eckrant	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
23---------- Frio	Good	Good	Fair	Good	Poor	Very poor	Good	Very poor	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements--						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
24---------- Hassee	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
25, 26---------- Krum	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
27:* Maloterre---------	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Tarrant----------	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
28---------- Minwells	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
29---------- Minwells	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
30---------- Minwells	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
31---------- Mosheim	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
32, 33---------- Paluxy	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
34---------- Paluxy	Fair	Fair	Good	Good	Poor	Very poor	Fair	Very poor	Good.
35.* Pits									
36, 37---------- Purves	Fair	Good	Poor	Fair	Poor	Very poor	Fair	Very poor	Poor.
38---------- Purves	Fair	Good	Poor	Good	Poor	Very poor	Fair	Very poor	Fair.
39:* Purves----------	Fair	Good	Poor	Good	Poor	Very poor	Fair	Very poor	Fair.
Maloterre---------	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
40---------- San Saba	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor	Fair.
41, 42---------- Searsville	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
43---------- Seawillow Variant	Fair	Good	Fair	Good	Poor	Very poor	Fair	Very poor	Fair.
44---------- Selden	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
45, 46---------- Slidell	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
47, 48---------- Sunev	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
49---------- Tarpley	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements--						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
50*---------- Tarrant	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
51---------- Windthorst	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
52---------- Windthorst	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
53---------- Windthorst	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
54---------- Windthorst	Poor	Fair	Good	Good	Poor	Very poor	Fair	Very poor	Good.
55:*									
Yahola----------	Poor	Fair	Fair	Good	Poor	Very poor	Fair	Very poor	Fair.
Gaddy----------	Very poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1, 2, 3---Bastrop	Slight	Slight	Slight	Slight	Moderate: low strength.
4---Bastrop	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
5---Bastrop	Slight	Slight	Slight	Slight	Moderate: low strength.
6---Bolar	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
7---Bolar	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
8---Bosque	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
9---Brackett	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
10:*					
Brackett	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Eckrant	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
11, 12, 13, 14, 15---Cranfill	Moderate: too clayey, small stones.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
16---Crawford	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
17, 18---Denton	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
19---Duffau	Slight	Slight	Slight	Slight	Moderate: low strength.
20, 21---Duffau	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
22*---Eckrant	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
23---Frio	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
24---Hassee	Severe: too clayey, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
25, 26--- Krum	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
27:*					
Maloterre---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Tarrant---	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
28--- Minwells	Moderate: too clayey.	Moderate: shrink-swell,	Moderate: shrink-swell,	Moderate: shrink-swell,	Severe: low strength.
29--- Minwells	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.
30--- Minwells	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
31--- Mosheim	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
32, 33--- Paluxy	Slight---	Slight---	Slight---	Slight---	Moderate: low strength.
34--- Paluxy	Slight---	Slight---	Slight---	Moderate: slope.	Moderate: low strength.
35.* Pits					
36, 37, 38--- Purves	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
39:*					
Purves---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Maloterre---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
40--- San Saba	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
41, 42--- Searsville	Severe: depth to rock, too clayey.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell, low strength.
43--- Seawillow Variant	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
44--- Selden	Moderate: wetness.	Slight---	Moderate: wetness.	Slight---	Moderate: low strength.
45, 46--- Slidell	Severe: too clayey, cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
47, 48---------- Sunev	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength.
49---------- Tarpley	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.
50*---------- Tarrant	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
51---------- Windthorst	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
52---------- Windthorst	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
53---------- Windthorst	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
54---------- Windthorst	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
55:*					
Yahola----------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Gaddy----------	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1---- Bastrop	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----	Slight----	Good.
2---- Bastrop	Moderate: percs slowly.	Moderate: seepage.	Slight----	Slight----	Good.
3, 4, 5---- Bastrop	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----	Slight----	Good.
6, 7---- Bolar	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Slight----	Fair: too clayey.
8---- Bosque	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
9---- Brackett	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----	Poor: thin layer.
10:*					
Brackett----	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer.
Eckrant----	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope.	Poor: too clayey, large stones.
11, 12, 13, 14, 15-- Cranfill	Moderate: percs slowly.	Moderate: seepage, slope, small stones.	Moderate: too clayey.	Slight----	Fair: too clayey, small stones.
16---- Crawford	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight----	Poor: too clayey.
17, 18---- Denton	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: too clayey, depth to rock.	Slight----	Poor: too clayey.
19---- Duffau	Slight----	Moderate: seepage.	Slight----	Slight----	Good.
20, 21---- Duffau	Slight----	Moderate: seepage, slope.	Slight----	Slight----	Good.
22*---- Eckrant	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Slight----	Poor: too clayey, large stones.
23---- Frio	Severe: floods, percs slowly.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
24---- Hassee	Severe: Percs slowly.	Slight----	Severe: too clayey, wetness.	Severe: wetness.	Poor: thin layer.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
25---------- Krum	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey.
26---------- Krum	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey.
27:* Maloterre----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer.
Tarrant----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer. large stones. too clayey.
28, 29, 30---------- Minwells	Severe: percs slowly.	Moderate: slope.	Severe: seepage.	Slight----------	Fair: too clayey.
31---------- Mosheim	Severe: percs slowly.	Moderate: slope.	Severe: depth to rock, too clayey.	Slight----------	Poor: too clayey.
32, 33, 34---------- Paluxy	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
35.* Pits					
36, 37, 38---------- Purves	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer, too clayey.
39:* Purves----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer, too clayey.
Maloterre----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer.
40---------- San Saba	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight----------	Poor: too clayey.
41, 42---------- Searsville	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight----------	Poor: thin layer, area reclaim, too clayey.
43---------- Seawillow Variant	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: too clayey, thin layer.
44---------- Selden	Severe: percs slowly.	Moderate: slope.	Slight----------	Slight----------	Good.
45---------- Slidell	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey.
46---------- Slidell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey.
47, 48---------- Sunev	Slight----------	Severe: seepage.	Slight----------	Slight----------	Fair: excess lime.
49---------- Tarpley	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: thin layer, too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
50* Tarrant	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, large stones, too clayey.
51, 52, 53, 54 Windthorst	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
55:*					
Yahola	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Gaddy	Severe: floods.	Severe: seepage, floods.	Severe: seepage, too sandy, floods.	Severe: floods, seepage.	Fair: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1---------- Bastrop	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
2, 3, 4, 5---------- Bastrop	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
6, 7---------- Bolar	Poor: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
8---------- Bosque	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
9---------- Brackett	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.
10:*				
Brackett----------	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.
Eckrant----------	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, large stones.
11, 12, 13, 14, 15---- Cranfill	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime, small stones.
16---------- Crawford	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
17, 18---------- Denton	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
19, 20, 21---------- Duffau	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
22*---------- Eckrant	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, large stones.
23---------- Frio	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
24---------- Hassee	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
25, 26---------- Krum	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
27:*				
Maloterre----------	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess lime.
Tarrant----------	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
28, 29, 30---------- Minwells	Poor: low strength.	Poor: excess fines, small stones.	Fair: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
31--Mosheim	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
32, 33, 34--Paluxy	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
35.* Pits				
36, 37, 38--Purves	Poor: shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, thin layer.
39:*				
Purves	Poor: shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, thin layer.
Maloterre	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess lime.
40--San Saba	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
41--Searsville	Poor: low strength, thin layer, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, area reclaim.
42--Searsville	Poor: low strength, thin layer, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, area reclaim, small stones.
43--Seawillow Variant	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.
44--Selden	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too sandy.
45, 46--Slidell	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
47, 48--Sunev	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
49--Tarpley	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
50*--Tarrant	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
51, 52, 53, 54--Windthorst	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
55*:				
Yahola	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Gaddy	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1, 2, 3, 4, 5----- Bastrop	Moderate: seepage.	Slight---------	Not needed-----	Fast intake, soil blowing, slope.	Soil blowing---	Erodes easily.
6, 7---------- Bolar	Severe: seepage.	Moderate: thin layer.	Depth to rock	Excess lime----	Favorable------	Favorable.
8---------- Bosque	Moderate: seepage.	Moderate: compressible.	Not needed-----	Favorable------	Floods---------	Floods.
9---------- Brackett	Severe: seepage.	Severe: thin layer.	Depth to rock	Droughty, excess lime, rooting depth.	Depth to rock, rooting depth.	Droughty, rooting depth.
10:*						
Brackett---------	Severe: seepage.	Severe: thin layer.	Depth to rock	Droughty, excess lime, rooting depth.	Depth to rock, rooting depth.	Droughty, rooting depth.
Eckrant----------	Severe: depth to rock.	Severe: thin layer, large stones.	Not needed-----	Rooting depth, droughty.	Depth to rock, large stones.	Rooting depth.
11, 12---------- Cranfill	Moderate: seepage.	Slight---------	Not needed-----	Favorable------	Favorable------	Favorable.
13, 14---------- Cranfill	Moderate: seepage.	Slight---------	Not needed-----	Slope----------	Favorable------	Favorable.
15---------- Cranfill	Moderate: seepage.	Slight---------	Not needed-----	Slope----------	Favorable------	Favorable.
16---------- Crawford	Severe: depth to rock.	Moderate: thin layer.	Not needed-----	Slow intake----	Percs slowly---	Percs slowly.
17, 18---------- Denton	Severe: depth to rock.	Moderate: compressible, shrink-swell.	Not needed-----	Percs slowly---	Favorable------	Favorable.
19, 20, 21-------- Duffau	Moderate: seepage.	Moderate: erodes easily, piping.	Not needed-----	Erodes easily	Erodes easily	Erodes easily.
22*---------- Eckrant	Severe: depth to rock.	Severe: thin layer, large stones.	Not needed-----	Rooting depth, droughty.	Depth to rock, large stones.	Rooting depth.
23---------- Frio	Moderate: seepage.	Moderate: compressible.	Not needed-----	Floods---------	Favorable------	Favorable.
24---------- Hassee	Slight---------	Moderate: unstable fill.	Percs slowly---	Slow intake----	Percs slowly---	Droughty, percs slowly.
25, 26---------- Krum	Moderate: seepage.	Moderate: hard to pack.	Not needed-----	Slow intake, slope.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
27:*						
Maloterre--------	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Droughty, rooting depth.	Depth to rock	Droughty, rooting depth.
Tarrant----------	Severe: depth to rock.	Severe: thin layer, large stones.	Depth to rock	Rooting depth	Depth to rock, large stones.	Rooting depth, large stones.
28, 29, 30-------- Minwells	Moderate: seepage.	Moderate: thin layer.	Not needed-----	Percs slowly---	Percs slowly---	Percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
31---------- Mosheim	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Not needed-----	Percs slowly, slow intake.	Percs slowly---	Percs slowly.
32, 33, 34-------- Paluxy	Severe: seepage.	Moderate: piping.	Not needed-----	Favorable------	Erodes easily	Favorable.
35.* Pits						
36, 37---------- Purves	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Droughty, rooting depth.	Depth to rock	Rooting depth, droughty.
38---------- Purves	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Rooting depth, droughty.	Depth to rock, rooting depth.	Droughty, rooting depth.
39:* Purves---------- Maloterre--------	Severe: depth to rock. Severe: depth to rock.	Severe: thin layer. Severe: thin layer.	Depth to rock Depth to rock	Rooting depth, droughty. Droughty, rooting depth.	Depth to rock, rooting depth. Depth to rock	Droughty, rooting depth. Droughty, rooting depth.
40---------- San Saba	Severe: depth to rock.	Moderate: thin layer.	Percs slowly---	Slow intake----	Percs slowly---	Percs slowly.
41---------- Searsville	Severe: depth to rock.	Severe: thin layer.	Not needed-----	Slow intake, rooting depth, percs slowly.	Depth to rock, percs slowly.	Depth to rock, rooting depth, percs slowly.
42---------- Searsville	Severe: depth to rock.	Severe: thin layer.	Not needed-----	Slow intake, rooting depth, percs slowly.	Depth to rock, percs slowly.	Depth to rock, percs slowly, rooting depth.
43---------- Seawillow Variant	Severe: seepage.	Moderate: thin layer.	Not needed-----	Favorable------	Favorable------	Favorable.
44---------- Selden	Moderate: seepage.	Slight---------	Percs slowly---	Erodes easily, soil blowing.	Erodes easily	Erodes easily.
45, 46---------- Slidell	Slight---------	Moderate: compressible, unstable fill.	Percs slowly---	Slow intake----	Percs slowly---	Percs slowly.
47, 48---------- Sunev	Severe: seepage.	Moderate: compressible, piping.	Not needed-----	Excess lime----	Favorable------	Favorable.
49---------- Tarpley	Severe: depth to rock.	Severe: thin layer.	Not needed-----	Rooting depth, percs slowly.	Depth to rock	Rooting depth.
50*---------- Tarrant	Severe: depth to rock.	Severe: thin layer, large stones.	Depth to rock	Rooting depth	Depth to rock, large stones.	Rooting depth, large stones.
51, 52, 53, 54---- Windthorst	Moderate: seepage.	Moderate: compressible.	Percs slowly---	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
55:* Yahola---------- Gaddy----------	Severe: seepage. Severe: seepage.	Moderate: unstable fill, seepage, piping. Moderate: unstable fill, piping.	Not needed----- Not needed-----	Floods--------- Seepage--------	Not needed----- Erodes easily	Not needed. Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1---------- Bastrop	0-17	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	95-100	80-100	75-95	20-50	<20	NP-4
	17-80	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	80-100	80-100	40-70	26-40	11-22
2, 3, 4, 5--------- Bastrop	0-15	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	80-100	36-70	18-25	2-7
	15-80	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	80-100	80-100	40-70	26-40	11-22
6, 7---------- Bolar	0-15	Clay loam-------	CL, SC	A-6, A-7, A-4	0-5	75-100	75-100	70-98	40-80	25-42	9-25
	15-37	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0-10	75-95	75-95	70-90	40-75	25-42	11-25
	37-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
8---------- Bosque	0-26	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-95	24-40	7-22
	26-63	Loam, clay loam	CL	A-4, A-6, A-7-6	0	100	95-100	95-100	55-80	26-45	10-25
9---------- Brackett	0-17	Gravelly clay loam.	CL, SC	A-6, A-4, A-7-6	0-20	70-100	60-100	54-95	40-85	28-43	10-26
	17-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
10:* Brackett----------	0-15	Gravelly clay loam.	CL, SC	A-6, A-4, A-7-6	0-20	70-100	60-100	54-95	40-85	28-43	10-26
	15-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Eckrant----------	0-10	Cobbly clay-----	GC, SC, CH	A-7-6, A-2-7	25-75	45-90	40-90	35-85	30-85	54-74	31-49
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
11, 12, 13, 14, 15- Cranfill	0-10	Gravelly clay loam.	SC, CL, GC, SM	A-6, A-7	0-5	65-85	60-75	50-75	36-70	30-45	11-24
	10-54	Gravelly clay loam, gravelly loam, gravelly silty clay loam.	SC, CL, GC	A-6, A-7, A-2-6, A-2-7	0-5	55-80	50-75	40-75	30-70	30-45	11-24
	54-80	Gravelly clay loam, gravelly silty clay loam.	SC, CL, GC	A-6, A-7	0-5	65-85	60-75	50-75	36-70	35-48	18-28
16---------- Crawford	0-26	Clay----------	CH, MH	A-7-5, A-7-6	0-5	85-100	85-100	75-100	70-100	51-80	30-50
	26-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
17, 18---------- Denton	0-25	Silty clay------	CH, MH, CL	A-7	0-10	80-100	80-100	80-100	75-95	49-70	26-45
	25-36	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0-20	80-100	80-100	80-100	70-95	41-60	21-40
	36-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
19, 20, 21--------- Duffau	0-11	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-90	30-60	<25	NP-7
	11-60	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
	60-68	Sandy clay loam, loam, fine sandy loam.	SC, CL, CL-ML, SM	A-4, A-6	0	95-100	95-100	80-100	40-65	20-36	2-18
22*---------- Eckrant	0-10	Cobbly clay-----	GC, SC, CH	A-7-6, A-2-7	25-75	45-90	40-90	35-85	30-85	54-74	31-49
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
23---------- Frio	0-42	Silty clay loam	CL, CH	A-6, A-7	0-2	80-100	80-100	70-100	60-95	35-52	20-34
	42-63	Silty clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0-2	65-100	65-100	60-100	55-95	35-52	20-34
24---------- Hassee	0-14	Fine sandy loam	CL	A-4, A-6	0	95-100	95-100	80-100	50-80	20-35	8-16
	14-36	Clay----------	CH, CL	A-7-6	0	95-100	95-100	95-100	75-95	41-60	24-40
	36-60	Clay, clay loam	CH, CL	A-7-6, A-6	0	95-100	95-100	90-100	70-95	35-52	20-35
25, 26---------- Krum	0-5	Clay----------	CH, CL	A-7-6	0	95-100	85-100	85-100	85-95	47-65	25-42
	5-46	Silty clay, clay	CH	A-7-6	0	95-100	85-100	80-100	65-95	51-74	28-50
	46-63	Silty clay loam, silty clay, clay.	CH, CL	A-7-6, A-6	0	85-100	75-100	70-99	65-95	36-60	20-38
27:*											
Maloterre---------	0-5	Gravelly clay loam.	SC, CL, GC	A-6	0-10	60-95	50-95	45-90	36-80	30-40	11-20
	5-7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tarrant----------	0-12	Cobbly clay-----	CH, GC	A-7-6	33-77	55-100	51-100	51-95	45-95	55-76	31-49
	12-16	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
28, 29, 30--------- Minwells	0-14	Fine sandy loam	CL, CL-ML, SC, SM-SC	A-4, A-6	0	90-100	85-100	60-90	36-60	18-30	5-15
	14-36	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0	90-100	85-100	80-100	51-95	43-58	21-35
	36-46	Clay loam, sandy clay loam, gravelly sandy clay loam.	CL, SC	A-6, A-7-6, A-2-6	0	75-100	70-100	55-100	30-80	32-45	15-25
	46-80	Very gravelly sand, very gravelly sandy loam, gravelly sandy clay loam.	SC, GM, SP-SM, GP-GM	A-1, A-2	0-5	15-75	10-60	5-50	5-30	<44	NP-28

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
31---------- Mosheim	0-22	Silty clay------	CH	A-7-6	0	95-100	95-100	90-100	80-98	52-70	30-44
	22-48	Silty clay loam, silty clay, gravelly silty clay loam.	CL, CH	A-6, A-7-6	0-2	70-100	65-95	60-99	51-99	35-52	15-30
	48-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
32, 33, 34--------- Paluxy	0-70	Very fine sandy loam.	SM, SM-SC, CL-ML, ML	A-4, A-2-4	0	100	98-100	70-100	30-60	<25	NP-7
	70-80	Very fine sandy loam, loam.	SM, SM-SC, CL-ML, ML	A-4, A-2-4	0	100	98-100	70-100	30-60	<25	NP-7
35.* Pits											
36, 37---------- Purves	0-7	Clay----------	CH	A-7-6	0-5	90-100	80-100	80-95	70-95	51-65	30-40
	7-18	Gravelly clay, very gravelly clay, gravelly clay loam.	CH, SC	A-7-6	0-35	60-100	60-100	55-95	45-90	51-65	30-40
	18-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
38---------- Purves	0-7	Gravelly clay---	CH, GC, SC	A-7-6	5-25	55-95	55-95	45-95	36-90	51-65	30-40
	7-15	Gravelly clay, very gravelly clay, stony clay.	GC, CH, SC	A-7-6	5-35	55-95	55-95	45-90	36-65	51-65	30-40
	15-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
39:* Purves----------	0-16	Gravelly clay---	CH, GC, SC	A-7-6	5-25	55-95	55-95	45-95	36-90	51-65	30-40
	16-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Maloterre---------	0-5	Gravelly clay loam.	SC, CL, GC	A-6	0-10	60-95	50-95	45-90	36-80	30-40	11-20
	5-7	Weathered bedrock.	---	---	---	---	---	---	---	---	---
40---------- San Saba	0-36	Clay----------	CH, MH	A-7-5, A-7-6	0	90-100	85-100	80-100	75-100	55-70	30-45
	36-38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
41---------- Searsville	0-14	Clay----------	CH	A-7-6	0-5	90-100	85-100	80-100	65-98	51-68	30-42
	14-18	Clay, silty clay, gravelly clay.	CH, CL	A-7-6	0-10	80-100	75-100	65-100	55-95	48-65	28-40
	18-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
42----------	0-14	Gravelly clay---	CH	A-7-6	0-5	70-85	65-80	60-80	51-75	51-68	30-42
Searsville	14-18	Gravelly clay, gravelly silty clay.	CH, CL	A-7-6	0-10	70-85	65-80	60-80	51-75	48-65	28-40
	18-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
43----------	0-7	Clay loam-------	CL	A-6	0	85-100	80-100	80-100	60-80	30-40	11-20
Seawillow Variant	7-36	Clay loam, gravelly clay loam.	CL, SC	A-6	0-5	60-95	55-95	50-95	36-75	30-40	11-20
	36-80	Very gravelly loam.	SC, SM-SC, GC, GM-GC	A-2-4, A-2-6, A-4, A-6	0-10	20-65	16-60	14-55	10-45	21-35	4-15
44----------	0-12	Loamy fine sand	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	90-100	8-28	<25	NP-4
Selden	12-60	Sandy clay loam, clay loam.	SC, CL	A-2-6, A-6	0	95-100	95-100	90-100	25-55	20-35	11-20
45, 46----------	0-22	Clay----------	CH	A-7-6	0	95-100	95-100	95-100	85-100	51-68	28-42
Slidell	22-63	Silty clay, clay	CH, CL	A-7-6, A-6	0	95-100	95-100	85-100	75-100	40-60	20-38
47, 48----------	0-18	Clay loam-------	CL, SC	A-4, A-6	0	90-100	80-100	80-100	45-60	25-40	8-18
Sunev	18-36	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	80-100	80-100	51-65	28-40	8-18
	36-60	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	75-100	75-100	51-61	25-40	8-18
49----------	0-7	Clay loam-------	CL, CH	A-7	0-3	90-100	90-100	80-95	70-90	41-60	20-38
Tarpley	7-15	Clay----------	CH	A-7	0	90-100	90-100	90-100	65-98	70-90	45-60
	15-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
50*----------	0-12	Cobbly clay-----	CH, GC	A-7-6	33-77	55-100	51-100	51-95	45-95	55-76	31-49
Tarrant	12-16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
51, 52, 53, 54-----	0-3	Fine sandy loam	SM, SM-SC, CL-ML	A-4	0	95-100	90-100	75-100	36-75	<28	NP-7
Windthorst	3-42	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	51-90	35-53	20-35
	42-54	Sandy clay loam, clay, fine sandy loam.	SC, CL	A-4, A-6, A-7-6	0	85-100	80-100	75-100	36-90	25-45	8-28
	54-60	Stratified variable.	---	---	---	---	---	---	---	---	---
55:*											
Yahola----------	0-10	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	10-38	Fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	36-85	<30	NP-10
	38-63	Fine sandy loam, loam, loamy fine sand.	SM, SC, ML, CL	A-4, A-2	0	100	95-100	90-100	15-85	<30	NP-10
Gaddy----------	0-10	Loamy fine sand	SM	A-2	0	100	98-100	90-100	15-35	---	NP
	10-60	Loamy fine sand, fine sand.	SM	A-2	0	100	98-100	90-100	15-35	---	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	Pct	In/hr	In/in	pH					Pct
1----------	0-17	3-12	2.0-6.0	0.07-0.11	5.6-7.3	Low----------	0.37	5	2	.5-1
Bastrop	17-80	20-35	0.6-2.0	0.15-0.19	5.6-8.4	Low----------	0.32			
2, 3, 4, 5-------	0-15	10-20	2.0-6.0	0.11-0.17	5.6-7.3	Low----------	0.37	5	3	.5-1
Bastrop	15-80	20-35	0.6-2.0	0.15-0.19	5.6-8.4	Low----------	0.32			
6, 7----------	0-15	25-40	0.6-2.0	0.11-0.20	7.9-8.4	Moderate-----	0.32	2	---	1-3
Bolar	15-37	25-40	0.6-2.0	0.11-0.20	7.9-8.4	Moderate-----	0.17			
	37-40	---	---	---	---	----------	---			
8----------	0-26	20-35	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.28	5	4L	1-4
Bosque	26-63	20-35	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.28			
9----------	0-17	15-35	0.2-0.6	0.10-0.20	7.9-8.4	Low----------	0.32	2	4L	<1
Brackett	17-60	---	---	---	---	----------	---			
10:*										
Brackett--------	0-15	15-35	0.2-0.6	0.10-0.20	7.9-8.4	Low----------	0.32	2	4L	<1
	15-60	---	---	---	---	----------	---			
Eckrant---------	0-10	40-60	0.2-0.6	0.05-0.12	6.6-8.4	Moderate-----	0.10	1	---	---
	10-12	---	---	---	---	----------	---			
11, 12, 13, 14, 15----------	0-10	---	0.6-2.0	0.10-0.18	7.9-8.4	Moderate-----	0.28	5	---	---
Cranfill	10-54	---	0.6-2.0	0.10-0.17	7.9-8.4	Moderate-----	0.28			
	54-80	---	0.6-2.0	0.10-0.17	7.9-8.4	Moderate-----	0.28			
16----------	0-26	42-60	<0.06	0.14-0.18	6.1-8.4	Very high----	0.32	2	4	1-3
Crawford	26-30	---	---	---	---	----------	---			
17, 18----------	0-25	35-60	0.06-0.2	0.15-0.20	7.9-8.4	High---------	0.32	2	4	1-4
Denton	25-36	35-60	0.06-0.2	0.15-0.20	7.9-8.4	High---------	0.32			
	36-40	---	---	---	---	----------	---			
19, 20, 21-------	0-11	5-18	2.0-6.0	0.11-0.15	6.1-7.8	Low----------	0.43	5	3	<1
Duffau	11-60	20-35	0.6-2.0	0.12-0.19	6.1-7.8	Low----------	0.32			
	60-68	15-35	0.6-2.0	0.10-0.15	6.1-7.8	Low----------	0.32			
22*----------	0-10	40-60	0.2-0.6	0.05-0.12	6.6-8.4	Moderate-----	0.10	1	---	---
Eckrant	10-12	---	---	---	---	----------	---			
23----------	0-42	35-50	0.2-0.6	0.15-0.22	7.9-8.4	Moderate-----	0.32	5	4	1-4
Frio	42-63	35-50	0.2-0.6	0.11-0.22	7.9-8.4	Moderate-----	0.32			
24----------	0-14	10-20	0.6-2.0	0.11-0.20	6.1-7.3	Low----------	0.43	5	5	<2
Hassee	14-36	45-60	<0.06	0.12-0.18	6.1-8.4	High---------	0.32			
	36-60	35-60	<0.06	0.12-0.20	6.6-8.4	High---------	0.32			
25, 26----------	0-5	35-55	0.2-0.6	0.15-0.20	7.4-8.4	High---------	0.32	5	---	1-3
Krum	5-46	40-60	0.2-0.6	0.14-0.20	7.9-8.4	High---------	0.32			
	46-63	35-60	0.2-0.6	0.14-0.20	7.9-8.4	High---------	0.32			
27:*										
Maloterre-------	0-5	30-45	0.2-0.6	0.13-0.16	7.9-8.4	Low----------	0.15	1	---	---
	5-7	---	---	---	---	----------	---			
Tarrant---------	0-12	40-60	0.2-0.6	0.10-0.17	7.9-8.4	Moderate-----	0.20	1	4	---
	12-16	---	---	---	---	----------	---			
28, 29, 30-------	0-14	10-20	2.0-6.0	0.10-0.15	6.1-7.8	Low----------	0.24	5	3	<1
Minwells	14-36	35-45	0.06-0.2	0.12-0.18	6.1-7.3	Moderate-----	0.32			
	36-46	20-35	0.2-0.6	0.10-0.18	6.6-8.4	Moderate-----	0.32			
	46-80	3-20	2.0-6.0	0.01-0.09	7.4-8.4	Low----------	0.15			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	Pct	In/hr	In/in	pH					Pct
31----------	0-22	35-60	0.06-0.2	0.15-0.20	7.9-8.4	High----------	0.32	3	---	1-3
Mosheim	22-48	35-60	0.06-0.2	0.10-0.20	7.9-8.4	High----------	0.32			
	48-60	---	---	---	---	----------	---			
32, 33, 34-------	0-70	10-20	2.0-6.0	0.14-0.20	6.1-7.8	Low----------	0.28	5	3	.5-1
Paluxy	70-80	10-20	2.0-6.0	0.14-0.20	7.9-8.4	Low----------	0.28			
35.*										
Pits										
36, 37----------	0-7	35-55	0.2-0.6	0.12-0.18	7.9-8.4	High----------	0.32	1	---	1-3
Purves	7-18	35-55	0.2-0.6	0.08-0.18	7.9-8.4	High----------	0.32			
	18-20	---	---	---	---	----------	---			
38----------	0-7	35-55	0.2-0.6	0.08-0.15	7.9-8.4	High----------	0.24	1	---	1-3
Purves	7-15	35-55	0.2-0.6	0.08-0.15	7.9-8.4	High----------	0.24			
	15-20	---	---	---	---	----------	---			
39:*										
Purves----------	0-16	35-55	0.2-0.6	0.08-0.15	7.9-8.4	High----------	0.24	1	---	1-3
	16-20	---	---	---	---	----------	---			
Maloterre-------	0-5	30-45	0.2-0.6	0.13-0.16	7.9-8.4	Low----------	0.15	1	---	---
	5-7	---	---	---	---	----------	---			
40----------	0-36	45-60	<0.06	0.15-0.20	7.4-8.4	Very high----	0.32	2	4	1-4
San Saba	36-38	---	---	---	---	----------	---			
41----------	0-14	---	0.06-0.2	0.12-0.18	7.9-8.4	High----------	0.32	1	---	---
Searsville	14-18	---	0.06-0.2	0.10-0.18	7.9-8.4	High----------	0.32			
	18-22	---	---	---	---	----------	---			
42----------	0-14	---	0.06-0.2	0.09-0.15	7.9-8.4	High----------	0.28	1	---	---
Searsville	14-18	---	0.06-0.2	0.09-0.15	7.9-8.4	High----------	0.28			
	18-22	---	---	---	---	----------	---			
43----------	0-7	27-35	0.6-2.0	0.12-0.20	7.9-8.4	Moderate-----	0.32	5	4L	.5-1
Seawillow	7-36	27-35	0.6-2.0	0.10-0.18	7.9-8.4	Low----------	0.28			
Variant	36-80	8-25	2.0-6.0	0.06-0.12	7.9-8.4	Low----------	0.28			
44----------	0-12	3-15	2.0-6.0	0.05-0.09	5.6-7.3	Low----------	0.17	5	2	<1
Selden	12-60	20-35	0.2-0.6	0.12-0.17	5.1-6.5	Low----------	0.24			
45, 46----------	0-22	40-60	<0.06	0.15-0.20	7.4-8.4	High----------	0.32	5	4	1-4
Slidell	22-63	40-60	<0.06	0.15-0.20	7.4-8.4	High----------	0.32			
47, 48----------	0-18	20-40	0.6-2.0	0.11-0.16	7.9-8.4	Low----------	0.28	5	41	---
Sunev	18-36	20-40	0.6-2.0	0.11-0.16	7.9-8.4	Low----------	0.28			
	36-60	20-40	0.6-2.0	0.11-0.16	7.9-8.4	Low----------	0.28			
49----------	0-7	---	0.2-0.6	0.15-0.20	6.1-7.8	High----------	0.32	1	---	---
Tarpley	7-15	---	0.06-0.2	0.12-0.18	6.1-7.8	Very high----	0.32			
	15-18	---	---	---	---	----------	---			
50*----------	0-12	40-60	0.2-0.6	0.10-0.17	7.9-8.4	Moderate-----	0.20	1	4	---
Tarrant	12-16	---	---	---	---	----------	---			
51, 52, 53, 54---	0-3	5-18	0.6-2.0	0.12-0.17	5.6-7.3	Low----------	0.49	5	3	<1
Windthorst	3-42	35-50	0.2-0.6	0.15-0.20	5.6-7.3	Moderate-----	0.37			
	42-54	15-45	0.2-0.6	0.12-0.20	5.6-8.4	Moderate-----	0.37			
	54-60	---	---	---	---	----------	---			
55:*										
Yahola----------	0-10	---	2.0-6.0	0.12-0.16	7.4-8.4	Low----------	0.32	5	3	---
	10-38	---	2.0-6.0	0.12-0.16	7.9-8.4	Low----------	0.32			
	38-63	---	2.0-6.0	0.07-0.16	7.9-8.4	Low----------	0.32			
Gaddy----------	0-10	---	6.0-20	0.07-0.11	7.4-8.4	Low----------	0.17	5	2	---
	10-60	---	6.0-20	0.06-0.10	7.9-8.4	Low----------	0.17			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "brief" and "perched." Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
1, 2, 3, 4, 5----- Bastrop	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
6, 7----------- Bolar	C	None--------	---	---	>6.0	---	---	20-40	Rippable	High-----	Low.
8----------- Bosque	B	Occasional	Brief-----	Oct-May	>6.0	---	---	>60	---	High-----	Low.
9----------- Brackett	C	None--------	---	---	>6.0	---	---	10-20	Rippable	High-----	Low.
10:* Brackett---------	C	None--------	---	---	>6.0	---	---	10-20	Rippable	High-----	Low.
Eckrant----------	D	None--------	---	---	>6.0	---	---	8-20	Hard	High-----	Low.
11, 12, 13, 14, 15----------- Cranfill	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
16----------- Crawford	D	None--------	---	---	>6.0	---	---	20-40	Hard	High-----	Low.
17, 18---------- Denton	D	None--------	---	---	>6.0	---	---	22-40	Rippable	High-----	Low.
19, 20, 21-------- Duffau	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
22*---------- Eckrant	D	None--------	---	---	>6.0	---	---	8-20	Hard	High-----	Low.
23----------- Frio	B	Occasional	Brief-----	Oct-May	>6.0	---	---	>60	---	High-----	Low.
24----------- Hassee	D	None--------	---	---	1.0-2.0	Perched	May-Oct	>60	---	High-----	Low.
25, 26---------- Krum	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
27:* Maloterre--------	D	None--------	---	---	>6.0	---	---	3-10	Hard	High-----	Low.
Tarrant----------	D	None--------	---	---	>6.0	---	---	6-20	Hard	High-----	Low.
28, 29, 30-------- Minwells	C	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
31----------- Mosheim	D	None--------	---	---	>6.0	---	---	40-60	Rippable	High-----	Low.
32, 33, 34-------- Paluxy	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Low.
35*. Pits											
36, 37, 38-------- Purves	D	None--------	---	---	>6.0	---	---	8-20	Hard	High-----	Low.
39:* Purves----------	D	None--------	---	---	>6.0	---	---	8-20	Hard	High-----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
39:*											
Maloterre	D	None	---	---	>6.0	---	---	3-10	Hard	High	Low.
40---------- San Saba	D	None	---	---	>6.0	---	---	24-40	Hard	High	Low.
41, 42---------- Searsville	D	None	---	---	>6.0	---	---	10-20	Hard	High	Low.
43---------- Seawillow Variant	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
44---------- Selden	C	None	---	---	>6.0	---	---	>60	---	High	Moderate.
45, 46---------- Slidell	D	None	---	---	>6.0	---	---	>60	---	High	Low.
47, 48---------- Sunev	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
49---------- Tarpley	D	None	---	---	>6.0	---	---	13-20	Hard	High	Low.
50*---------- Tarrant	D	None	---	---	>6.0	---	---	6-20	Hard	High	Low.
51, 52, 53, 54---- Windthorst	C	None	---	---	>6.0	---	---	>60	---	High	Low.
55:*											
Yahola	B	Frequent	Very brief	Mar-Aug	>6.0	---	---	>60	---	Low	Low.
Gaddy	A	Frequent	Very brief	Mar-Aug	>6.0	---	---	>60	---	Low	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING TEST DATA

[Dashes indicate data were not available]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution[1]										Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage passing sieve--							Percentage smaller than--								
	AASHTO	Unified	7/4 inch	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm				Limit	Linear	Ratio
													Pct		G/cc	Pct	Pct	Pct
Brackett gravelly loam[3] (S73TX-018-005)																		
A1--------0 to 8	A-6 (05)	SC	100	87	82	73	64	54	47	--	31	21	39	19	2.67	20.0	9.2	1.7
B2--------8 to 15	A-7-6(22)	CL	100	100	100	99	98	94	84	--	54	34	43	26	2.70	18.0	11.7	1.7
Cranfill gravelly clay loam:[4] (S73TX-018-008)																		
A1--------0 to 10	A-7-6(02)	SM	100	92	87	77	70	59	42	--	19	10	42	13	2.58	24.0	8.3	1.5
B2ca------10 to 22	A-2-6(01)	SC	94	87	81	69	56	42	32	--	20	12	32	13	2.68	19.0	6.5	1.7
B3ca------22 to 54	A-6 (04)	SC	100	96	91	77	64	51	42	--	25	17	38	21	2.70	19.0	9.5	1.7
Cca-------54 to 80	A-7-6(09)	CL	100	89	84	76	68	57	51	--	31	25	43	26	2.70	16.0	12.7	1.8
Denton silty clay:[5] (S73TX-018-002)																		
A12-------5 to 12	A-7-6(28)	CH	100	100	99	99	98	96	91	--	56	44	50	29	2.68	17.0	14.7	1.8
A13-------12 to 24	A-7-6(33)	CH	100	100	99	99	98	97	93	--	59	47	54	32	2.67	12.0	18.4	1.9
Bca-------24 to 32	A-7-6(35)	CH	100	100	100	99	98	96	93	--	63	50	55	35	2.70	10.0	19.6	2.0
Cca-------32 to 36	A-7-6(06)	GC	100	84	76	65	57	51	46	--	29	21	44	23	2.66	15.0	13.7	1.8
Frio clay loam:[6] (S73TX-018-001)																		
A12-------5 to 24	A-7-6(24)	CL	100	100	100	100	100	100	89	--	46	36	44	27	2.65	15.0	13.7	1.8
Cca-------42 to 63	A-7-6(31)	CL	100	100	100	100	100	100	93	--	56	44	49	32	2.68	16.0	14.6	1.8
Krum clay:[7] (S73TX-018-003)																		
A1--------5 to 22	A-7-6(44)	CH	100	100	100	100	99	98	96	--	63	51	65	40	2.68	18.0	18.4	1.8
B2--------22 to 46	A-7-6(39)	CH	100	100	100	99	98	95	93	--	64	50	58	38	2.71	11.0	20.0	2.0
Cca-------46 to 66	A-6 (19)	CL	100	100	100	100	99	97	94	--	61	35	36	20	2.71	13.0	11.5	1.9

See footnotes at end of table.

TABLE 18.--ENGINEERING TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution[1]										Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage passing sieve							Percentage smaller than--								
	AASHTO	Unified	7/4 inch	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm				Limit	Linear	Ratio
													Pct		G/cc	Pct	Pct	Pct
Mosheim silty clay:[8] (S73TX-018-006)																		
Ap--------0 to 8	A-7-6(41)	CH	100	100	100	100	99	98	96	--	60	48	63	37	2.67	13.0	20.3	1.9
A12--------8 to 22	A-7-6(45)	CH	100	100	100	100	99	99	97	--	56	48	66	40	2.70	10.0	22.3	2.0
B21ca----22 to 30	A-7-6(43)	CH	100	100	100	100	100	99	97	--	58	48	64	38	2.69	11.0	21.4	2.0
B23ca----36 to 48	A-7-6(15)	CL	100	99	98	94	88	82	73	--	47	32	42	22	2.70	17.0	11.6	1.8
Searsville clay:[9] (S73TX-018-007)																		
Ap--------0 to 7	A-7-6(41)	CH	100	100	100	99	99	99	96	--	48	42	62	37	2.67	11.0	20.8	2.0
B21--------7 to 14	A-7-6(37)	CH	100	98	97	97	96	95	92	--	50	42	60	36	2.66	11.0	20.6	2.0
B22ca----14 to 18	A-7-6(31)	CH	100	99	96	92	91	89	84	--	48	39	56	35	2.68	12.0	19.2	2.0

[1]For soil materials larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.

[2]Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods except that soil was added to water.

[3]Brackett gravelly loam:
7 miles west of Clifton on Farm Road 219; 2.3 miles north on Farm Road 182; 0.2 mile east on unpaved road; 50 feet south of road.

[4]Cranfill gravelly clay loam:
6.3 miles south of Meridian on Texas Highway 6, then 600 feet west.

[5]Denton silty clay:
4 miles west of Clifton on Farm Road 219; 500 feet north of road.

[6]Frio clay loam:
0.9 mile east of Clifton on Farm Road 219; 0.85 mile south on Farm Road 708; continue south on unpaved road 7.2 miles; west 0.3 miles.

[7]Krum clay:
5.9 miles west of Clifton on Farm Road 219; 300 feet north of road.

[8]Mosheim silty clay:
3.95 miles south of Clifton on Texas Highway 6; 9.3 miles west and south on Farm Road 2602; site is on north side of road.

[9]Searsville clay:
3.95 miles south of Clifton on Texas Highway 6; 5.5 miles west on Farm Road 2602; 1.7 miles west on unpaved road; 0.45 mile south, 125 feet east of road.

TABLE 19.--CLASSIFICATION OF THE SOILS

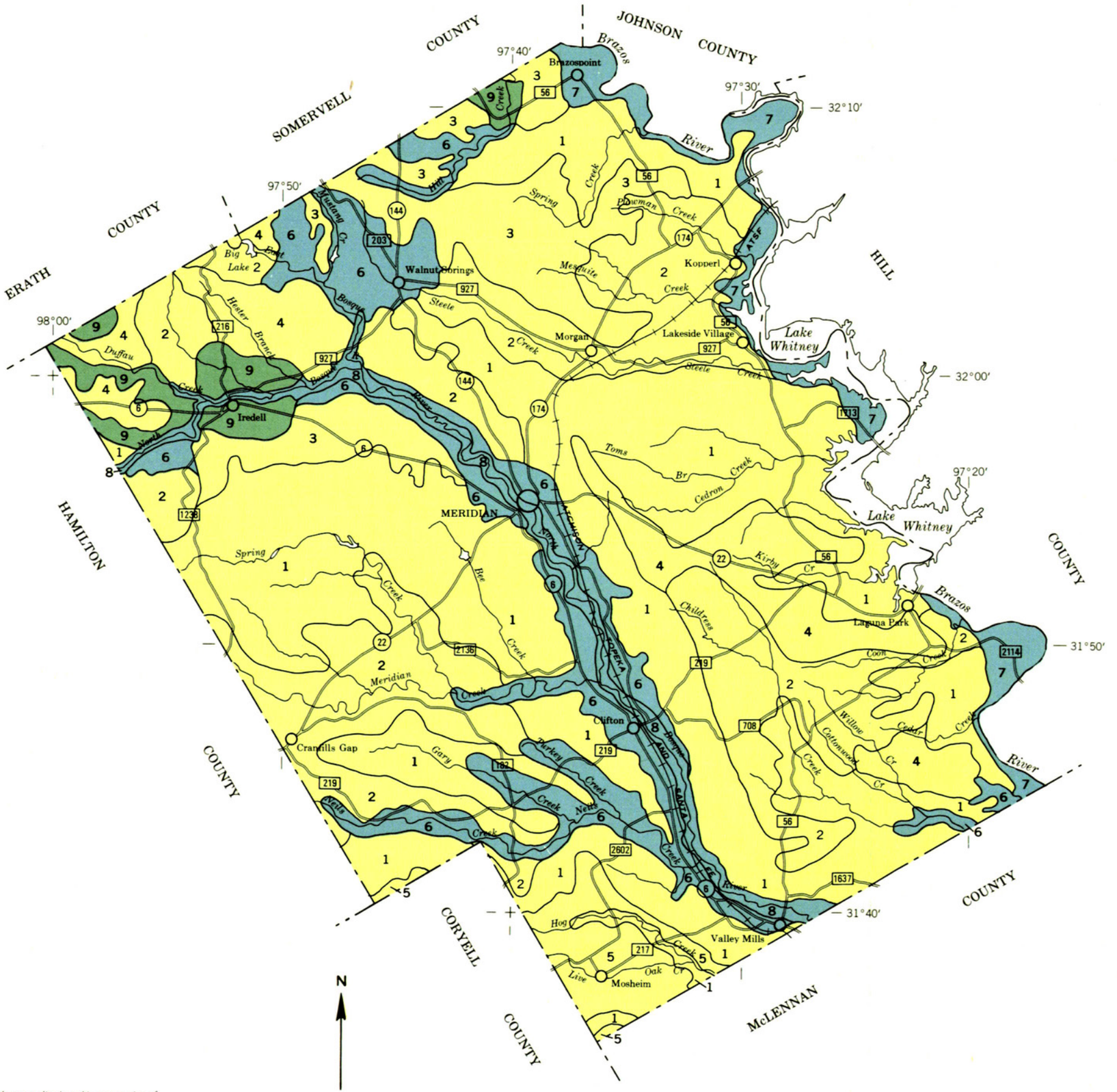
Soil name	Family or higher taxonomic class
Bastrop	Fine-loamy, mixed, thermic Udic Paleustalfs
Bolar	Fine-loamy, carbonatic, thermic Typic Calciustolls
Bosque	Fine-loamy, mixed, thermic Cumulic Haplustolls
Brackett	Loamy, carbonatic, thermic, shallow Typic Ustochrepts
Cranfill	Fine-loamy, carbonatic, thermic Typic Ustochrepts
Crawford	Fine, montmorillonitic, thermic Udic Chromusterts
Denton	Fine, montmorillonitic, thermic Vertic Calciustolls
Duffau	Fine-loamy, siliceous, thermic Udic Paleustalfs
Eckrant	Clayey-skeletal, montmorillonitic, thermic Lithic Haplustolls
Frio	Fine, mixed, thermic Cumulic Haplustolls
Gaddy	Sandy, mixed, thermic Typic Ustifluvents
Hassee	Fine, montmorillonitic, thermic Mollic Albaqualfs
Krum	Fine, montmorillonitic, thermic Vertic Haplustolls
Maloterre	Loamy, carbonatic, thermic Lithic Ustorthents
Minwells	Fine, mixed, thermic Udic Paleustalfs
Mosheim	Fine, montmorillonitic, thermic Vertic Calciustolls
Paluxy	Coarse-loamy, mixed, thermic Udic Ustochrepts
Purves	Clayey, montmorillonitic, thermic Lithic Calciustolls
San Saba	Fine, montmorillonitic, thermic Udic Pellusterts
Searsville	Clayey, mixed, thermic Lithic Ustochrepts
Seawillow Variant	Fine-loamy, carbonatic, thermic Typic Ustochrepts
Selden	Fine-loamy, siliceous, thermic Aquic Paleustalfs
Slidell	Fine, montmorillonitic, thermic Udic Pellusterts
Sunev	Fine-loamy, carbonatic, thermic Typic Calciustolls
Tarpley	Clayey, montmorillonitic, thermic Lithic Vertic Argiustolls
Tarrant	Clayey-skeletal, montmorillonitic, thermic Lithic Calciustolls
Windthorst	Fine, mixed, thermic Udic Paleustalfs
Yahola	Coarse-loamy, mixed (calcareous), thermic Typic Ustifluvents

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980-299-340/109

NRCS Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



LEGEND*

DOMINANTLY VERY SHALLOW TO DEEP, WELL DRAINED SOILS UNDERLAIN BY LIMESTONE

1 — Eckrant-Brackett-Cranfill: Very shallow, shallow, and deep, gently sloping to steep clayey and loamy soils that are cobbly and gravelly

2 — Denton-Purves: Moderately deep and shallow, gently sloping and sloping clayey soils

3 — Tarrant-Denton: Very shallow to moderately deep, gently sloping and undulating clayey soils that are cobbly

4 — Purves-Maloterre: Shallow and very shallow, gently sloping and undulating clayey and loamy soils that are gravelly

5 — Mosheim-Searsville: Deep and shallow, gently sloping clayey soils

DEEP, WELL DRAINED SOILS ON FLOOD PLAINS AND STREAM TERRACES

6 — Krum-Sunev: Nearly level and gently sloping, clayey and loamy soils

7 — Bastrop-Minwells-Yahola: Nearly level and gently sloping, loamy and sandy soils

8 — Frio-Bosque: Nearly level, loamy soils

DEEP, MODERATELY WELL DRAINED AND WELL DRAINED SOILS ON UPLANDS

9 — Windthorst-Duffau: Gently sloping and sloping, loamy soils

*The textures noted in the descriptive headlines apply to the surface layer of the major soils.

Compiled 1979

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

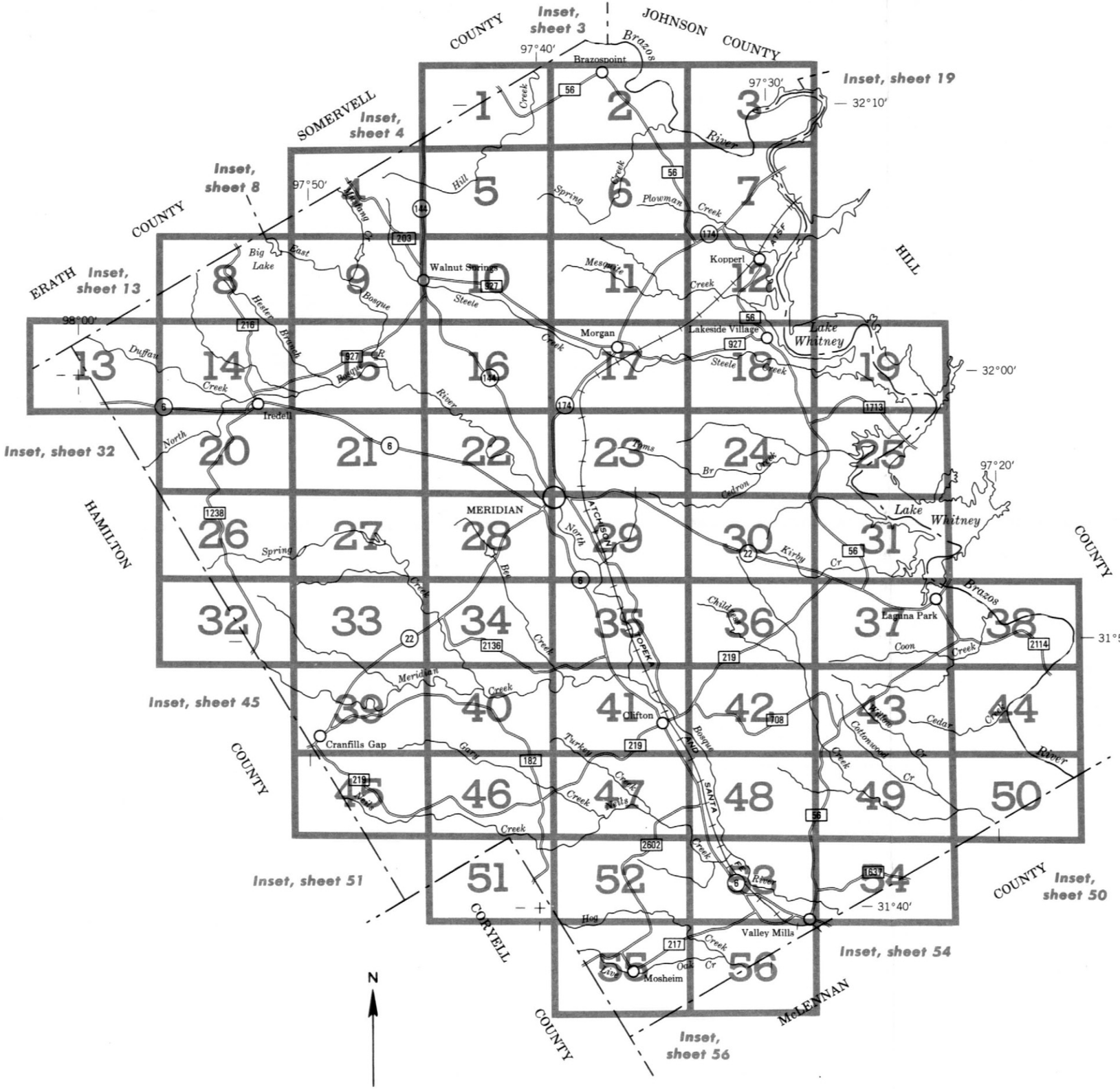
GENERAL SOIL MAP
BOSQUE COUNTY, TEXAS

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km

INDEX TO MAP SHEETS
BOSQUE COUNTY, TEXAS



Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label) — Hedley Airstrip
- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1263

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water, w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CnB, WaC2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

SOIL LEGEND

If slope is not indicated in the soil name, the soil is level or nearly level. Soil names followed by the superscript 1/ are broadly defined units.

SYMBOL	NAME
1	Bastrop loamy fine sand, 1 to 5 percent slopes
2	Bastrop fine sandy loam, 0 to 1 percent slopes
3	Bastrop fine sandy loam, 1 to 3 percent slopes
4	Bastrop fine sandy loam, 3 to 5 percent slopes
5	Bastrop fine sandy loam, 1 to 5 percent slopes, eroded
6	Bolar clay loam, 1 to 3 percent slopes
7	Bolar clay loam, 3 to 5 percent slopes
8	Bosque loam, occasionally flooded
9	Brackett gravelly clay loam, 1 to 5 percent slopes
10	Brackett-Eckrant association, hilly 1/
11	Cranfill gravelly clay loam, 3 to 5 percent slopes
12	Cranfill gravelly clay loam, 3 to 5 percent slopes, eroded
13	Cranfill gravelly clay loam, 5 to 8 percent slopes
14	Cranfill gravelly clay loam, 5 to 8 percent slopes, eroded
15	Cranfill gravelly clay loam, 3 to 8 percent slopes, severely eroded
16	Crawford clay, 1 to 3 percent slopes
17	Denton silty clay, 1 to 3 percent slopes
18	Denton silty clay, 3 to 5 percent slopes
19	Duffau fine sandy loam, 1 to 3 percent slopes
20	Duffau fine sandy loam, 3 to 5 percent slopes
21	Duffau fine sandy loam, 1 to 5 percent slopes, eroded
22	Eckrant association, gently undulating 1/
23	Frio silty clay loam, occasionally flooded
24	Hassee fine sandy loam, 0 to 2 percent slopes
25	Krum clay, 0 to 1 percent slopes
26	Krum clay, 1 to 3 percent slopes
27	Maloterre-Tarrant complex, 1 to 8 percent slopes
28	Minwells fine sandy loam, 1 to 3 percent slopes
29	Minwells fine sandy loam, 3 to 5 percent slopes
30	Minwells fine sandy loam, 1 to 5 percent slopes, eroded
31	Mosheim silty clay, 1 to 3 percent slopes
32	Paluxy very fine sandy loam, 0 to 1 percent slopes
33	Paluxy very fine sandy loam, 1 to 3 percent slopes
34	Paluxy very fine sandy loam, 5 to 8 percent slopes
35	Pits
36	Purves clay, 1 to 3 percent slopes
37	Purves clay, 3 to 5 percent slopes
38	Purves gravelly clay, 1 to 5 percent slopes
39	Purves-Maloterre association, undulating 1/
40	San Saba clay, 1 to 3 percent slopes
41	Searsville clay, 1 to 3 percent slopes
42	Searsville gravelly clay, 1 to 5 percent slopes
43	Seawillow Variant clay loam, 1 to 5 percent slopes
44	Selden loamy fine sand, 1 to 5 percent slopes
45	Slidell clay, 0 to 1 percent slopes
46	Slidell clay, 1 to 3 percent slopes
47	Sunev clay loam, 0 to 1 percent slopes
48	Sunev clay loam, 1 to 3 percent slopes
49	Tarpley clay loam, 1 to 3 percent slopes
50	Tarrant association, undulating 1/
51	Windthorst fine sandy loam, 1 to 3 percent slopes
52	Windthorst fine sandy loam, 3 to 5 percent slopes
53	Windthorst fine sandy loam, 1 to 5 percent slopes, eroded
54	Windthorst fine sandy loam, 1 to 8 percent slopes, severely eroded
55	Yahola-Gaddy complex, frequently flooded

1/ The composition of these units is more variable than that of the others in the survey area but has been controlled well enough to be interpreted for the anticipated use of the soils.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 1

2 800 000 FEET

925 000 FEET

COUNTY

BOUNDARY

INDEFINITE

SOMERVELL

water

Creek

Hill

North

Hill Creek

water

(Joins inset, sheet 4)

(Joins sheet 2)

(Joins sheet 5)

2 825 000 FEET

910 000 FEET

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1

N

2 Miles

10000 Feet

Scale 1:24000

0 1000 2000 3000 4000 5000

BOSQUE COUNTY, TEXAS — SHEET NUMBER 2

(2)

N

(Joins inset, sheet 3)

2 855 000 FEET

925 000 FEET

(Joins sheet 1)

(Joins sheet 3)

910 000 FEET

2 830 000 FEET

(Joins sheet 6)

SOMERVELL CO

Eulogy

Brazos Point

Dry Branch Creek

Rock Creek

Flat

BRAZOS RIVER

FLOOD POOL LINE

JOHNSON COUNTY

water

Nebraska Bluff

Yearling Branch

Sprina Creek

Frog Hollow

2 Miles

10000 Feet

Scale 1:24000

5000 0 1000 2000 3000 4000 5000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 3

3

N

2 860 000 FEET

2 830 000 FEET

934 000 FEET

925 000 FEET

930 000 FEET

915 000 FEET

2 845 000 FEET

2 885 000 FEET

SOMERVELL COUNTY

JOHNSON COUNTY

HILL COUNTY

BRAZOS RIVER

INDEFINITE BOUNDARY

FLOOD POOL LINE

KIMBALL BEND

Frog Hollow

Bee Mountain

(Joins sheet 2)

(Joins sheet 7)

(Joins inset, sheet 19)

4000 AND 5000-FOOT GRID TICKS

2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 4

4

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

2 797 000 FEET

910 000 FEET

908 000 FEET

SOMERVELL

INDEFINITE

COUNTY BOUNDARY

(Joins sheet 1)

(Joins upper right)

2 792 000 FEET

2000 AND 5000-FOOT GRID TICKS

2 795 000 FEET

(Joins inset)

905 000 FEET

South Fork Hill Creek

BOUNDARY COUNTY

SOMERVELL

INDEFINITE

Mustang Creek

Steele Creek

Pohuie Lakes

water

890 000 FEET

2 770 000 FEET

(Joins inset, sheet 8)

(Joins sheet 9)

(Joins sheet 5)

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 5

2 800 000 FEET

905 000 FEET

(Joins sheet 1)

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 10)

2 825 000 FEET

890 000 FEET

North Fork Hill Creek

South Fork Hill Creek

Cox Branch

5

N

Scale 1:24000

2 Miles 1 0

10000 Feet 5000 0

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 6

6

N

(Joins sheet 2)

2 855 000 FEET

910 000 FEET

(Joins sheet 5)

2 Miles

10000 Feet

5000

Scale 1:24000

890 000 FEET

2 830 000 FEET

(Joins sheet 11)

(Joins sheet 7)

Tuggle

Branch

Yearling

Creek

Spring

Branch

Creek

Hollow

Frog

water

water

Spring

Creek

Plowman

Creek

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 7

7

N

2 860 000 FEET

910 000 FEET

55

(Joins sheet 3)

JOHNSON COUNTY

BRAZOS RIVER

FLOOD POOL LINE

Kimball Community

KIMBALL BEND PARK

HILL

BRAZOS COUNTY

Indian Lodge

Robinson Bluff

SANTA FE

ATCHISON TOPEKA AND

Plowman Creek

Boggy Branch Creek

(Joins sheet 6)

(Joins sheet 12)

2885 000 FEET

895 000 FEET

2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

2 Miles

10000 Feet

Scale 1:24000

1 0 ½ 0 1 2 3 4 5 000 1000 2000 3000 4000 5000

2 767 000 FEET

891 000 FEET

887 000 FEET

2 762 000 FEET

COUNTY BOUNDARY

SOMERVELL

INDEFINITE

COUNTY

EARTH

Big Lake

(Joins upper right)

(Joins sheet 4)

4000 AND 5000-FOOT GRID TICKS

(Joins inset)

2 765 000 FEET

COUNTY

Flag Branch

Big Lake

Flag Branch Lake

Flag Branch

885 000 FEET

(Joins sheet 9)

EARTH

Walker Branch

Boyd

water

Hester

Rocky Creek

Branch

870 000 FEET

(Joins inset, sheet 13)

2 740 000 FEET

(Joins sheet 14)

53

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 9

9

N

2 770 000 FEET

885 000 FEET

(Joins sheet 4)

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 15)

2 795 000 FEET

870 000 FEET

ROUGH CREEK

Old Lake

Mustang Lake

Steele Creek

Flat Top Landing Strip

Mustang Creek

Irrigation Lake

Branch

East Flat Top Lake

Bosque River

Flat Top Mountain

Cedar Mountain

Barry Branch

Qunsby Lake

Walnut Springs

Flag

water

2 Miles

10000 Feet

Scale 1:24 000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 10

(10)

N

(Joins sheet 5)

2 825 000 FEET

885 000 FEET

(Joins sheet 9)

(Joins sheet 11)

2 800 000 FEET

870 000 FEET

(Joins sheet 16)

Walnut Springs

Steele Creek

Corn Gap

Cox Branch

Steele Branch Creek

water

2 Miles 10000 Feet

1 5000

Scale 1:24000

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 11

11

2 830 000 FEET

(Joins sheet 6)

885 000 FEET

water

water

Mesquite Creek

Creek

Mesquite Creek

Lewis

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 17)

2 855 000 FEET

875 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

12

N

(Joins sheet 7)

885 000 FEET

890 000 FEET

(Joins sheet 11)

875 000 FEET

860 000 FEET

(Joins sheet 18)

Scale 1:24000

2 Miles 10000 Feet

1 5000

0 0

¼ 1000

⅜ 2000

½ 3000

¾ 4000

1 5000

Kopperl

PLOWMAN CREEK PARK

LAKE WHITNEY

BRAZOS RIVER

HILL COUNTY

Raymond Creek

Mesquite Creek

Plowman Creek

Poon Branch

Flood Pool Line

Santa Fe and Topeka Atchison

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 13

13

N

2 715 000 FEET

865 000 FEET

(Joins inset)

ERATH COUNTY

HAMILTON COUNTY

Duffau

Camp

Rocky Creek

Branch

Creek

(Joins sheet 14)

2 730 000 FEET

874 000 FEET

(Joins upper right)

2 740 000 FEET

869 000 FEET

(Joins sheet 8)

850 000 FEET

(Joins inset, sheet 32)

2740 000 FEET

2 Miles

10000 Feet

Scale 1:24000

5000 4000 3000 2000 1000 0

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 14

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 15

15

2 770 000 FEET

865 000 FEET

50

(Joins sheet 9)

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 21)

2 800 000 FEET

850 000 FEET

South Flat Top Lake

water

Hester

Barry Branch

RIVER

BOSQUE

Dinner Hill

Branch

EAST

RIVER

BOSQUE

NORTH

Boyd Branch

Branch

Clayton

N

2 Miles

10000 Feet

Scale 1:24000

1 0 1 5000

¼ 0 ¼ 1000

½ ½ 2000 3000

¾ ¾ 4000 5000

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 16

16

N

(Joins sheet 10)

2 825 000 FEET

870 000 FEET

(Joins sheet 15)

(Joins sheet 17)

2 800 000 FEET

850 000 FEET

(Joins sheet 22)

Scale 1:24000

2 Miles 10000 Feet

1 5000 0 1000 2000 3000 4000 5000

Creek

NORTH BOSQUE RIVER

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 17

17

N

2 830 000 FEET

870 000 FEET

(Joins sheet 11)

(Joins sheet 16)

(Joins sheet 18)

(Joins sheet 23)

2 855 000 FEET

855 000 FEET

Morgan

Paris Branch

Steele Creek

Steele Creek

SANTA FE

TOPEKA AND SANTA FE

ATCHISON

927

174

2 Miles

10 000 Feet

5 000

Scale 1:24 000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 18

(18)

N

(Joins sheet 12)

2 885 000 FEET

870 000 FEET

LAKE WHITNEY

Powelldale Mountains

Lakeside Village

HILL COUNTY

Steele Creek

Steele Creek

Dry Branch

(Joins sheet 17)

855 000 FEET

2 860 000 FEET

(Joins sheet 24)

(Joins sheet 19)

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

1 0 1 2 3 4 5

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 19

19

2 890 000 FEET

870 000 FEET

HILL COUNTY

LAKE WHITNEY

STEELE CREEK PARK

LAKE WHITNEY

HILL COUNTY

(Joins sheet 18)

(Joins sheet 25)

2 915 000 FEET

855 000 FEET

2 886 000 FEET

920 000 FEET

915 000 FEET

(Joins sheet 3)

BRAZOS RIVER

2 891 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 20

20

N

(Joins sheet 14)

2 770 000 FEET

845 000 FEET

(Joins inset, sheet 32)

(Joins sheet 21)

830 000 FEET

(Joins sheet 26)

2 745 000 FEET

BOSQUE RIVER

NORTH

HAMILTON COUNTY

Johnson Peak

2 Miles

10000 Feet

Scale 1:24000

5000

0

1000

2000

3000

4000

5000

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 21

2 770 000 FEET

(Joins sheet 15)

21

N

845 000 FEET

Pikesville Community

Midway Community

Brandi

Gibson

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 27)

2 800 000 FEET

830 000 FEET

2 Miles

10000 Feet

Scale 1:24000

1 0 1 2 3 4 5

5000 4000 3000 2000 1000 0

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 22

22

N

(Joins sheet 16)

2 825 000 FEET

850 000 FEET

(Joins sheet 21)

(Joins sheet 23)

830 000 FEET

2 805 000 FEET

(Joins sheet 28)

water

NORTH Branch

Gibson

BOSQUE RIVER

MERIDIAN (county seat)

2 Miles 1

10000 Feet 5000 0

Scale 1:24000

1 5000 ¾ 4000 ½ 3000 ¼ 2000 0 1000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 23

23

N

2 830 000 FEET

850 000 FEET

(Joins sheet 17)

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 29)

2 855 000 FEET

835 000 FEET

SANTA FE

ATCHISON TOPEKA

Toms Branch

Pilot Knob

Cedron Creek

MERIDIAN (county seat)

2640

174

Scale 1:24 000

2 Miles

10000 Feet

5000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

(Joins sheet 18)

(Joins sheet 23)

(Joins sheet 25)

(Joins sheet 30)

2 885 000 FEET

850 000 FEET

835 000 FEET

2 860 000 FEET

Falls Branch

Toms Branch

Cedron Creek

FLOOD POOL LINE

This map is compiled on 1:7? aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 25

25

N

(Joins sheet 19)

2 890 000 FEET

850 000 FEET

LAKE WHITNEY RECREATIONAL AREA

LAKE WHITNEY

CEDRON CREEK PARK

COUNTY

HILL

Cedar Shores Estates

Cedron Creek

Falls Branch

FLOOD POOL LINE

(Joins sheet 24)

(Joins sheet 31)

835 000 FEET

2 915 000 FEET

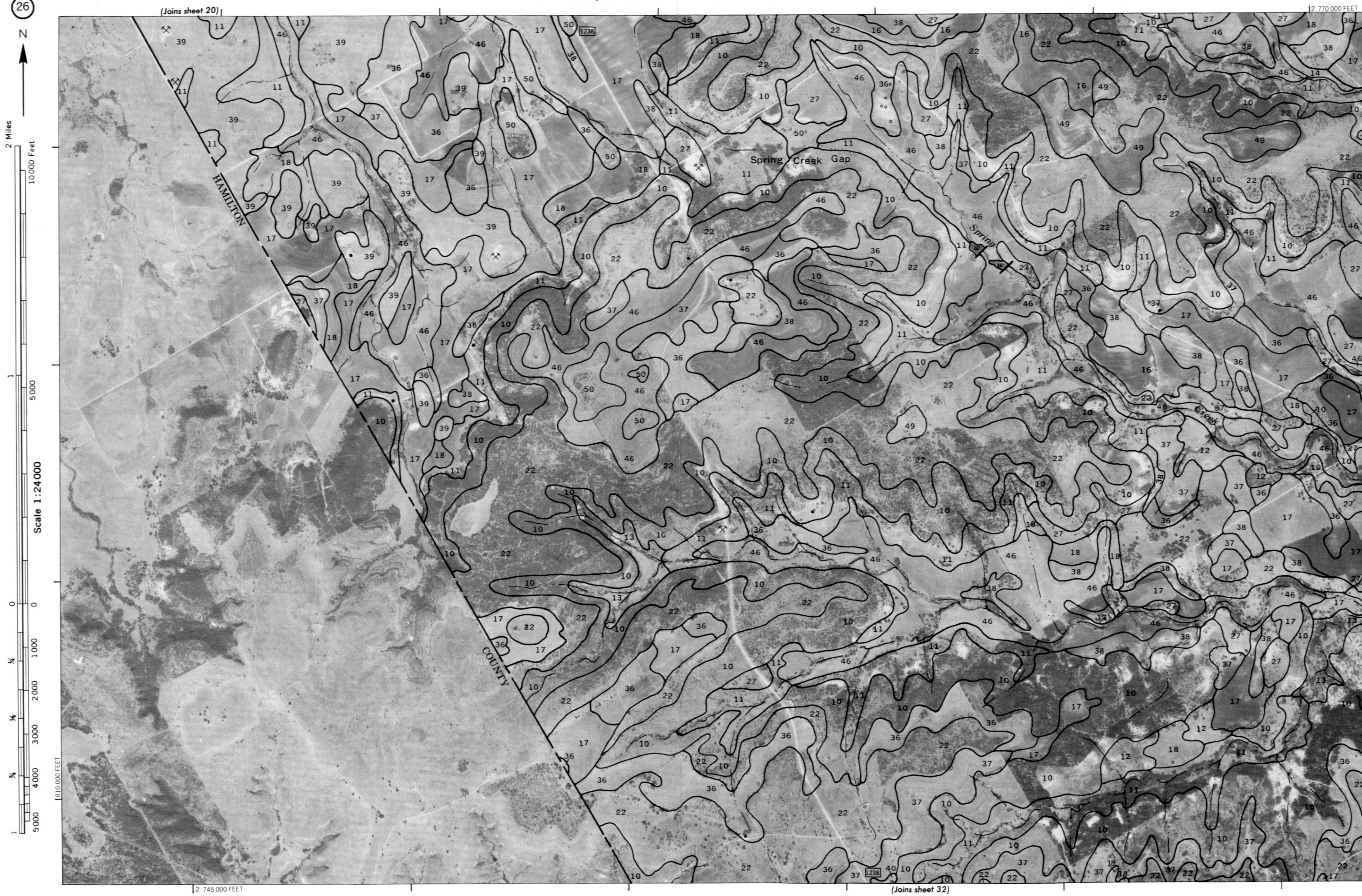
2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid tricks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 26



This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 27

N

2 775 000 FEET

825 000 FEET

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 33)

2 800 000 FEET

815 000 FEET

water

Creek

Spring

Spencer Mountain

2 Miles

10000 Feet

5000

Scale 1:24000

28

N

2 Miles

10000 Feet

1 5000

Scale 1:24000

(Joins sheet 22)

2 830 000 FEET

1 830 000 FEET

NORTH BOSQUE RIVER

MERIDIAN

Bee Creek

MERIDIAN STATE PARK

water

Dyes Creek

Creek

1473

(Joins sheet 27)

815 000 FEET

(Joins sheet 29)

(Joins sheet 34)

2 805 000 FEET

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 29

29

2 830 000 FEET

1830 000 FEET

(Joins sheet 23)

(Joins sheet 28)

(Joins sheet 30)

MERIDIAN
(county seat)

NORTH BOSQUE RIVER

ATCHISON, TOPEKA AND SANTA FE

Cedron Creek

Branch

Stanifer

Montgomery Creek

Dyes Creek

NORTH BOSQUE RIVER

Stanifer Branch

1991

N

2 Miles

10000 Feet

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

815 000 FEET

2 860 000 FEET

(Joins sheet 24)

2 885 000 FEET

N

2 Miles

10000 Feet

5000

(Joins sheet 29)

Scale 1:24000

1 0 1 0 ¼ 1000 ½ 2000 ¾ 3000 1 4000 5000

830 000 FEET

815 000 FEET

2 860 000 FEET

(Joins sheet 36)

(Joins sheet 31)

Cedron Creek

King Creek

Kirby Creek

Rocky Creek

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 31

2 890 000 FEET

(Joins sheet 25)

830 000 FEET

LAKE WHITNEY

LAKE WHITNEY

King Creek

Long Branch

Rocky Creek

Lakewood Harbor

Walling Bend

COUNTY LINE

HILL COUNTY LINE

FLOOD POOL LINE

(Joins sheet 30)

(Joins sheet 37)

2 915 000 FEET

815 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

32

N

2 Miles

10000 Feet

Scale 1:24000

(Joins sheet 13)

2 740 000 FEET

845 000 FEET

(Joins sheet 20)

(Joins sheet 26)

2 770 000 FEET

805 000 FEET

(Joins sheet 33)

HAMILTON COUNTY

BOSQUE COUNTY

NORTH Fall Creek

BOSQUE RIVER

North Prong Meridian Creek

Jackson Hill

1238

830 000 FEET

790 000 FEET

2 735 000 FEET

2 760 000 FEET

(Joins inset, sheet 45)

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 33

2 775 000 FEET

(Joins sheet 27)

805 000 FEET

Spencer Mountain

Number Six Mountain

Spencer Hollow

Camfield Hollow

Mustang Creek

Stiffy Spring Hollow

Stiffy Creek

Dunlap Branch

Mustang Branch

Flat Top Mountain

Dunlap Hill

Godager Hill

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 39)

795 000 FEET

2 800 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

34

N

(Joins sheet 28)

2 830 000 FEET

810 000 FEET

(Joins sheet 33)

Scale 1:24 000

2 Miles 1 0

10000 Feet 5000 0

5000 4000 3000 2000 1000 0

¾ ½ ¼

795 000 FEET

Spring Creek

Kay Mountain

Bee Creek

Brown Mountain

Golden Mountain

Arrs Mountain

2136

(Joins sheet 35)

(Joins sheet 40)

2 805 000 FEET

BOSQUE COUNTY, TEXAS — SHEET NUMBER 35

35

N

2 835 000 FEET

(Joins sheet 29)

810 000 FEET

NORTH BOSQUE RIVER

Schumacher Creek

Schumacher Creek

ATCHISON TOPEKA AND SANTA FE

NORTH BOSQUE RIVER

Brown Mountain

Bee Creek

Clifton Municipal Airport

(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 41)

2 860 000 FEET

795 000 FEET

2 Miles

10000 Feet

Scale 1:24000

This map was compiled on 1977 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(36)

N

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

(Joins sheet 30)

(Joins sheet 35)

(Joins sheet 42)

(Joins sheet 37)

2 885 000 FEET

810 000 FEET

795 000 FEET

2 865 000 FEET

Childress

Childress

Womack

Creek

Creek

Rocky

219

219

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 37

37

2 890 000 FEET

810 000 FEET

(Joins sheet 31)

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 43)

2 920 000 FEET

796 000 FEET

N

Scale 1:24 000

2 Miles 1 0

10000 Feet 5000 0

Rocky Creek

LAKE WHITNEY

HILL COUNTY

Soldiers Bluff

South Fork Rocky Creek

Laguna Park

Little Rocky Creek

Coon Creek

Coon Creek

POOL

FLOOD

LINE

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

2 945 000 FEET

815 000 FEET

LAKE WHITNEY

DAM

HILL COUNTY

BRAZOS RIVER

Coon Creek

Smiths Bend

SMITHS BEND

water

(Joins sheet 37)

(Joins sheet 44)

2 920 000 FEET

795 000 FEET

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 39

39

2 775 000 FEET

(Joins sheet 33)

790 000 FEET

(Joins inset, sheet 45)

(Joins sheet 40)

(Joins sheet 45)

2 800 000 FEET

775 000 FEET

MERIDIAN

CREEK

Mustang Creek

Branch

Austin

COUNTY

HAMILTON

Cranfills Gap

Cranfills Mountain

Rattlesnake Mountain

Jenson Mountain

Regstad Mountain

Gary Creek

219

22

N

2 Miles

10000 Feet

Scale 1:24000

1 0 1 2 3 4

5000 0 5000 10000 15000 20000 FEET

This map is compiled on 1937 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(40)

N

(Joins sheet 34)

2 830 000 FEET

790 000 FEET

(Joins sheet 39)

(Joins sheet 41)

775 000 FEET

2 805 000 FEET

(Joins sheet 46)

Scale 1:24000

2 Miles 10000 Feet

1 5000 0 1000 2000 3000 4000 5000

Spring Creek

MERIDIAN CREEK

Round Mountain

Rattlesnake Mountain

Gary Mountain

Gary Creek

Norse Hill

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 41

41

2 835 000 FEET

790 000 FEET

(Joins sheet 35)

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 47)

2 860 000 FEET

775 000 FEET

N

Scale 1:24000

2 Miles 1 0 10000 Feet

1 5000 0

1 5000 4000 3000 2000 1000 0

Bee Creek

Little Bee Rock

Big Bee Rock

Bee Rock Flats

Turkey Creek

North Meridian Creek

Meridian

Clifton Municipal Airport

Atchison Topeka & Santa Fe

Bosque River

CLIFTON

water

BOSQUE COUNTY, TEXAS — SHEET NUMBER 42

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 43

2 890 000 FEET

(Joins sheet 37)

790 000 FEET

(Joins sheet 42)

(Joins sheet 44)

780 000 FEET

(Joins sheet 49)

2 920 000 FEET

Willow

South

Prong

Coon

Creek

Childress

Cottonwood

Cayote

Cedar

43

N

2 Miles

10000 Feet

Scale 1:24000

1 0 1

¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

44

N

(Joins sheet 38)

(Joins sheet 43)

(Joins sheet 50)

2 945 000 FEET

2 925 000 FEET

795 000 FEET

780 000 FEET

Coon Creek

Coon Creek

South Prong

Cedar Creek

Cedar Creek

water

HILL COUNTY

BRAZOS RIVER

BRAZOS RIVER

Greenock Community

2114

2 Miles

10000 Feet

Scale 1:24000

1 0 1 2 Miles

5000 0 5000 10000 Feet

This map is compiled on 1977 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2 775 000 FEET

770 000 FEET

(Joins sheet 39)

(Joins sheet 32)

2 762 000 FEET

785 000 FEET

780 000 FEET

2 765 000 FEET

3000 AND 5000 FOOT GRID TICKS

(Joins sheet 46)

2 755 000 FEET

2 800 000 FEET

(Joins inset, sheet 51)

N

2 Miles

10000 Feet

5000

1

Scale 1:24000

5000 4000 3000 2000 1000 0

GOAR

VALLEY

HAMILTON

COUNTY

MERIDIAN

CREEK

Ilseng Mountain

Boggy Creek

North Fork

Meridian Creek

Middle Fork

South Fork

Neils Creek

water

(46)

N

2 Miles

10000 Feet

1 5000

Scale 1:24000

0 0 1000 2000 3000 4000 5000

(Joins sheet 40)

(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 51)

2 830 000 FEET

770 000 FEET

755 000 FEET

2 805 000 FEET

Gary Mountain

Gary Creek

Norse Hill

Norse Community

Gin Creek

Sugarloaf Mountain

Gully Branch

Boggy Creek

Neils Creek

Norman Hill

NEILS CREEK

CORYELL CO.

182

219

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate and tick and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 47

47

2 835 000 FEET

(Joins sheet 41)

770 000 FEET

(Joins sheet 46)

(Joins sheet 48)

(Joins sheet 52)

2 860 000 FEET

755 000 FEET

Turkey Creek

NEILS CREEK

Scale 1:24000

2 Miles 1 0

10000 Feet 5000 0

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 42)

2 890 000 FEET

775 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

1 5000 0

¼ 1000

½ 2000

¾ 3000

1 4000

5000

(Joins sheet 47)

(Joins sheet 49)

(Joins sheet 53)

755 000 FEET

2 865 000 FEET

ATCHISON TOPEKA AND SANTA FE

NORTH BOSQUE RIVER

Hogan Creek

NEILS CREEK

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 49

2 895 000 FEET

775 000 FEET

(Joins sheet 43)

(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 54)

760 000 FEET

2 920 000 FEET

N

Scale 1:24000

2 Miles

10000 Feet

Childress Creek

Cottonwood Creek

Willow Creek

Hogan Creek

Eisenhower Branch

Childress Creek

Cottonwood Creek

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 44)

2 950 000 FEET

775 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

5000

(Joins sheet 49)

Sheek Creek

HILL COUNTY

BRAZOS Creek

RIVER

MCLENNAN COUNTY

Willow Creek

Childress Creek

760 000 FEET

(Joins inset, sheet 50)

2 925 000 FEET

(Joins lower left)

2 930 000 FEET

(Joins sheet 54)

755 000 FEET

752 000 FEET

2 925 000 FEET

3000 AND 5000-FOOT GRID TICKS

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2 805 000 FEET

750 000 FEET

(Joins inset)

(Joins sheet 46)

2 795 000 FEET

(Joins sheet 45)

(Joins upper left)

740 000 FEET

2 800 000 FEET

735 000 FEET

2 830 000 FEET

(Joins sheet 52)

Jack Branch

Neils Creek

Middle Fork Neils Creek

South Fork

CORYELL COUNTY

HAMILTON COUNTY

N

2 Miles

10000 Feet

Scale 1:24000

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

52

N

(Joins sheet 47)

2 860 000 FEET

750 000 FEET

(Joins sheet 53)

2 Miles

10000 Feet

5000

1

(Joins sheet 51)

Scale 1:24000

0 0 1000 2000 3000 4000 5000

735 000 FEET

2 835 000 FEET

(Joins sheet 55)

NEILS CREEK

Neils Creek

GRAVEL PIT

Norway Hill

Shoal Creek

Hog Creek

Hog Creek

CORYELL COUNTY

2602

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 53

53

2 865 000 FEET

(Joins sheet 48)

750 000 FEET

(Joins sheet 52)

(Joins sheet 54)

740 000 FEET

(Joins sheet 56)

2 890 000 FEET

N

Scale 1:24 000

2 Miles

10000 Feet

5000

4000

NEILS CREEK

ATCHISON TOPEKA AND SANTA FE

NORTH BOSQUE RIVER

GRAVEL PIT

Thompson Hollow

Shoal Creek

Sears Creek

VALLEY MILLS

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 54

(Joins sheet 49)

2 920 000 FEET

755 000 FEET

(Joins inset, sheet 50)

N

2 Miles

10000 Feet

Scale 1:24000

1 0 1 2 3 4 5 Kilometers

1 0 1/2 1 1/2 2 2 1/2 3 3 1/2 4 4 1/2 5 Miles

(Joins sheet 53)

740 000 FEET

Branch

Eisenhower

Rock Springs

Creek

water

COUNTY

MCLENNAN

NORTH BOSQUE RIVER

1637

1637

(Joins inset)

2 895 000 FEET

(Joins lower left)

2 897 000 FEET

736 000 FEET

(Joins 56)

734 000 FEET

2 893 000 FEET

2000 AND 4000-FOOT GRID TICKS

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 55

55

2 835 000 FEET

730 000 FEET

(Joins sheet 52)

(Joins sheet 56)

(Joins inset, sheet 56)

2 860 000 FEET

715 000 FEET

N

Hog Creek

Live Oak Creek

Mosheim

CORYELL COUNTY

MCLENNAN COUNTY

2602

217

2 Miles

10000 Feet

5000

Scale 1:24000

This map is compiled on 1937 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BOSQUE COUNTY, TEXAS — SHEET NUMBER 56

56

N

Scale 1:24000

2 Miles 10000 Feet

1 5000 0

¼ 1000

½ 2000

¾ 3000

1 4000

1¼ 5000

(Joins sheet 53)

(Joins sheet 55)

(Joins inset, sheet 54)

2 890 000 FEET

735 000 FEET

720 000 FEET

715 000 FEET

710 000 FEET

2 865 000 FEET

2 860 000 FEET

2 850 000 FEET

Hog Creek

Live Oak Creek

Hog Creek

Creek

MCLENNAN COUNTY

CORYELL COUNTY

Middle Bosque River

ATCHISON

TOPEKA

SANTA FE

VALLEY MILLS

217

317

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.